DOCUMENT RESUME

ED 224 483 IR 050 022

AUTHOR Mason, Marilyn Gell
TITLE The Federal Role in Library Networking.
SPONS AGENCY Office of Libraries and Learning Technologies (ED), Washington, DC.
PUB DATE Feb 82
NOTE 113p.
PUB TYPE Information Analyses (070) -- Reports - Research/Technical (143)

EDRS PRICE MF01/PC05 Plus Postage.
DESCRIPTORS Consortia; Federal Aid; *Federal Government; *Government Role; Information Services; Library Cooperation; *Library Networks; Library Planning; *National Programs; Public Support; Shared Services
IDENTIFIERS *Federal Agencies

ABSTRACT

This paper examines library network activity in the United States and the past, present, and future roles of the federal government in nationwide library networking. The first chapter describes the history and development of library networks and defines terms used in the report. An examination of the current status of networks in the second chapter includes an outline of some of the most critical issues confronted and descriptions of four major information utilities and 21 state or multi-state service centers. Seven federal agencies specifically concerned with library networking are described in the third chapter, with particular attention given to the Library of Congress (LC) and the Office of Libraries and Learning Technologies Federal Library Committee (FLC). The fourth chapter outlines networking issues of specific concern to the federal government, explores interrelationships among the federal agencies involved with library networking, and identifies political and economic trends which affect the agencies. The role and future strategies of the federal agencies in networking are examined in the fifth chapter, which presents six objectives for future federal participation in library networking based on the decentralized development of library networks in response to local and regional service needs, and the historically supportive but non-directive federal role in this process. A 72-item bibliography concludes the report. (ESR)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

● This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

● Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

IR

ED224483

THE FEDERAL ROLE IN LIBRARY NETWORKING

a commissioned paper

by

Marilyn Gell Mason

February, 1982
Order No. 370-81-2799

IR050022

Prepared for the United States Department of Education, Office of Educational Research and Improvement, Office of Libraries and Learning Technologies. (The contents of this paper do not necessarily reflect the views or policies of the Department of Education.)

TABLE OF CONTENTS

EXECUTIVE SUMMARY.. 1

CHAPTER I : HISTORICAL PERSPECTIVE........................ 6

CHAPTER II : CURRENT STATUS............................... 20

CHAPTER III : THE FEDERAL SECTOR.......................... 45

CHAPTER IV : THE ISSUES................................... 67

CHAPTER V : FEDERAL ROLES AND THE EMERGING
NETWORK ENVIRONMENT........................... 92

BIBLIOGRAPHY.. 99

LIST OF FIGURES

FIGURE 1 : Basic Alternative Communications Designs.......... 22

FIGURE 2 : Geographic Area Served by the State and Multi-state Networks.......... 36

LIST OF TABLES

TABLE 1 : Service Centers/Networks.......... 38

EXECUTIVE SUMMARY

Networks are revolutionizing libraries and the world of information delivery. If they continue to grow at the rate of the last ten years they will transform libraries and the services they render. In many ways the network is to the library what the butterfly is to the caterpillar. The cocoon which libraries are spinning to protect themselves will eventually prove to be the catalytic element which will cause the evolution of libraries into a new and different entity.

The purpose of this paper is to examine the past, present and future roles of the Federal government in nationwide library networking. A clear understanding of the Federal role, however, can only emerge if we have a complete picture of library network activity.

It is fashionable in some circles to talk of a "national library network" as if a single monolithic structure either already exists, or is in the process of being constructed. A review of the historical development of networks indicates that networks have not developed as a result of centralized planning and management but have grown from the "bottom up" in response to local and regional service needs. While this development has been messy, it has also incorporated an uncommon amount of energy and creativity.

A snapshot of the current status of library networks reveals a complex and rapidly changing set of services and relationships.

Driven by technological developments, library networks are offering new services and finding new roles as they confront a variety of issues. Originally formed to increase productivity, networks now provide bibliographic access that creates a new range of options and services and lays the groundwork for the development of document delivery systems.

As networks grow in size and sophistication, distinctions must be made and more precise definitions sought. The first distinction is between cooperative and network. In this paper the term "network" is used to refer to those systems which rely on computer and communications technologies to facilitate resource sharing. Other types of cooperative efforts are described as "cooperatives" or "consortia." As it becomes necessary to distinguish between types of networks an additional refinement of definition is useful. Some authors restrict the use of the term "network" to those systems which actually provide the automated services and call the state and multi-state efforts "service centers." Other authors use "network" to describe the state and regional systems and the term "information utility" to designate large service providers. Thus the term network, even with its more restricted definition, is still ambiguous.

Since the scope of this paper is to describe the state of the art in library networking, no attempt is made to establish new terminology, although more precise terminology needs to be developed. Instead existing terminology is defined and used consistently. The term "network" as defined above is used generically to apply to both service providers and service brokers. Service providers such as OCLC, WLN, and RLIN are referred to as "information utilities" and state and multi-state systems such as SOLINET, INCOLSA, and NELINET are called "service centers".

A final distinction is imperative in a paper concerned with the Federal role in library networking. That is the difference between a "national library network" and a "nationwide library network." A "national library network" is used in this paper to mean a centrally planned, Federally managed, interconnected network which provides services to libraries of all types across the country. A "nationwide library network" refers to the geographic scope of a network or series of networks which together constitute a service to libraries across the nation. The appropriate role of the Federal government is different if one considers the ultimate goal of library networking to be a "national library network" as opposed to a "nationwide library network."

Generally speaking there are several roles that the Federal government has played, does play and will continue to play in library networking. They are:

- Research and Development
- Planning and Policy Making
- Financial Support
- Network Operation and Management

This report describes the current level of Federal activity in these areas, assesses the issues involved in each and looks at options for future involvement.

For many reasons outlined in this report, networks appear to be the model for libraries of the future. The primary role of the federal government is to build on the strengths already apparent in network growth to achieve increasing access to information for citizens throughout the country. This has after all been the goal of federal intervention since the Library Services Act sought to bring library service to the rural parts of our country. Objectives, however, may shift quite dramatically. In addition they depend not only on an idealized goal, but on the technological, economic and political environment that exists and the history of networking development as well.

Based on the information detailed in this paper, it appears that some reasonable objectives for federal participation in library networking might be:

- o Encourage the development of state and local networking capabilities by providing financial incentives for resource sharing.
- o Encourage the continued participation in resource sharing activities by major research libraries by subsidizing resource development.
- o Support research and development at an elevated level to achieve economies of scale, increased productivity, and advances in information technology that might even effect other parts of the economy.
- o Promote use of the latest technology within the government itself, so that federal agencies become a model for information handling and develop systems which can be

used in other contexts. The MARC tapes developed by the Library of Congress are one example of this type of activity.

- Provide a mechanism for the establishment and promulgation of standards.
- Adopt a laissez faire approach to the development of bibliographic utilities and state and regional networks with the exception of support for R&D.

These objectives suggest that the federal government is not striving to be all things to all people, nor is it seeking to develop a single monolithic structure. It accepts the somewhat messy approach to network development that has taken us very far very fast. In addition, it recognizes that some networks will succeed while others may fail, but the multiple experiments are likely to give the library community a great many more options.

CHAPTER I

HISTORICAL PERSPECTIVE

Many contend that networks have had a revolutionary impact on libraries. While this is certainly an accurate assessment of the past, it is a conservative view of the future. An analysis of the speed and scope of network development suggests that if networks continue to develop at the rate of the last ten years, they will completely transform libraries and library services. This chapter will define library and information networks, it will assess factors which have made network development possible and it will outline the major events in the short but dynamic history of library networking. Finally, it will examine those elements that lead to the preceding hypothesis about the future impact of networks.

DEFINITIONS

The word "network" has been variously defined. Some use the term in a general way to mean "a group of individuals or organizations that are interconnected." (Martin, 1981) This definition includes all types of cooperative activities among libraries such as formal and informal library consortia, information retrieval systems, and groups of library users having common interests.

Using this definition the history of library networks coincides with the history of library cooperation which is said to have begun in 1853 when Charles Jewett suggested the use of stereotype plates to produce a national union catalog. Other landmarks on the long and rocky road of library cooperation include the initiation of Library of Congress catalog card production and distribution in 1901 and the development of the Library of Congress book catalog and the National Union Catalog which existed as early as 1950.

While the term "library network" is still used by some to mean virtually any type of cooperative activity between libraries, a more precise definition is gaining general acceptance. The term "network" is now frequently used to mean "both the organizations and systems that link libraries together via telecommunications with computer-controlled message switching and data-base access." (Markuson, 1980) Characteristics include:

- support derived primarily from payment for services from participating libraries
- full time staff
- controlled by an independent governing body with a high level of involvement (generally through a board of directors from participating libraries)
- built around a cooperatively maintained bibliographic database in machine-readable form
- linked online by a telecommunications system

(Stevens,1980)

This definition clearly excludes cooperatives and consortia that are not organized around computer and communications systems. Although many of these organizations are becoming increasingly involved in networking activities, the distinction is important in the context of emerging issues.

DEVELOPMENTAL FACTORS

Library networks are clearly a product of the times. They are the natural consequence of political, economic and technological developments that affect all aspects of our society. More specifically library networks are the result of economic constraints, technological imperatives and the need to access a vast and growing body of print and non-print materials.

There was a time when scholarly libraries attempted to acquire all published materials in specific areas. Those days are now gone. In the United States alone between 35,000 and 40,000 books are published each year, and worldwide publication of periodicals is estimated to be approximately 120,000 titles per year. In addition research libraries must select from among numerous serials, foreign publications and government documents. Faced with this explosion of information libraries can no longer hope to meet the needs of their clienteles using only the materials from their own collections.

Even if it were physically possible to collect everything, it has become an economic daydream. The economic picture in recent years has been gloomy. Unrelenting inflation and the declining fiscal capacity of many of our governmental units and institutions has resulted in reduced budgets and increased costs for most libraries. Thus libraries have struggled to do more with less and have scrambled to find ways to increase productivity. While labor and materials costs have risen sharply, the costs of computer and communications capabilities have dropped, thereby providing an incentive for library administrators to seek technological solutions to economically induced problems.

Advances in information technologies have created new options for libraries. Computers are getting smaller, faster, cheaper, more reliable, and more pervasive. Computer memory has shrunk 800 times in size since 1953 and continues to shrink at the same rate. Computer circuitry with a switching time faster than 20 trillionths of a second now exists. Moreover, the cost of electronic logic and memory has been falling at a rate of 25 percent to 30 percent a year, compounded over the last two decades, and cost of storage technology has been decreasing by 40 percent annually. (Mason, 1981)

Communications systems, too, are changing rapidly and are becoming increasingly indistinguishable from computer systems. Thus we are seeing the growth of massive "telecomputing" capabilities. Digital information may now be transmitted using the electromagnetic spectrum (radio, television, satellite) or some form of telephone line or cable. The cost of communications is falling at the rate of 11 percent, with satellite costs alone falling 40 percent annually. (Mason, 1981)

As a result of these developments libraries turned to computer and communications systems to reduce costs, increase productivity and improve access to materials owned by other institutions. The network was born.

EVENTS

The concept of library networks grew out of a tradition of library cooperation that dates back to the 19th century. While a full history of cooperative efforts is outside the scope of this paper, those efforts were based on a belief that intellectual effort profits from the sharing of resources. The first major effort to describe a library network appeared in 1969 in **Conceptual Design of an Automated National Library System** prepared by Norman Meise. This publication presented the potentials of technology and its possible applications in strengthening the cooperative interrelationships of libraries.

In 1970 the Conference on Interlibrary Communications and Information Networks laid the philosophical groundwork for the development of library networks. The conference was sponsored by the U.S. Office of Education and the American Library Association and it was held at Airlie House in Warrenton, Virginia. Attendees at that conference predicted that "networks will bring drastic changes to administrative relationships among existing institutions and that new agencies are likely to be created to meet the pressures of networking potential and capabilities." (Becker, 1971) It was also at that conference that the idea of a "National Library Network", complete with federal funding and national planning and management, was born. Some of the basic tenets professed at that meeting include:

- that national planning, leadership and direction are essential to network development
- that large-scale federal funding of library networks is

essential to their development

- that networks will result from a linkage of local and state networks and will build upon present state-level cooperatives and consortia such as the New York NYSILL interlibrary loan networks and from local academic networks based on local university computer centers
- that some type of national agency, such as NCLIS, Library of Congress, or a new federal agency, will be required to govern and manage the development of a national library network. (Markuson, 1980)

In the decade that has elapsed since these preconditions were articulated networking activity has grown far beyond the wildest dreams of the participants. Today 25 functioning network organization exist that serve over 2300 libraries from an estimated 4000 on-line terminals. While federal funding has provided an important contribution to these activities, the pattern of networking we see today is primarily the result of local initiatives and self-financing.

The pivotal event that led to the emergence of an unplanned and uncoordinated system of networks was an action taken by the Library of Congress in the 1960s. At that time LC embarked on the creation of machine-readable cataloging data and began distribution in 1969. MARC tapes as they came to be known, provided a standard but the Library of Congress made no provision for direct access to the database. Many organizations experimented with the tapes. One such organization was the Ohio College Library Center (now OCLC,Inc.). It devised a system whereby MARC tapes, supplemented by original cataloging done by member libraries, could be used to generate catalog cards quickly and economically. In 1970 it performed its first batch processing for 54 member libraries, and in 1971 it became the first organization to offer online operations.

Things happened quickly after that. NELINET (New England Library Information Network) abandoned its efforts to develop an independent database and contracted for services with OCLC as did PRLC (Pittsburgh Regional Library Center) and FAUL (Five Associated University Libraries). This action paved the way for what was to become the dominant pattern. Regional networks were formed "in order to facilitate contracting with OCLC for the use of its cataloging subsystem, to provide training and assistance in the use of the subsystem, and to provide a focal point for other network activities." (Stevens, 1980) This system of distribution of OCLC services through state and multistate networks has worked so well that from 1971 to 1979 OCLC has grown from a system which provided on-line service to a single library with one terminal linked to a sole computer to a system serving 3000 terminals in over 2000 libraries requiring 30 mainframe and minicomputers. (Markuson, 1980)

Although the vast majority of state and multistate networks were developed to broker the services of OCLC, a few chose to develop independent databases and offer additional services. These included: Washington Library Network (WLN), Research Libraries Information Network (RLIN), and University of Toronto Library Automation System (UTLAS).

WLN, the youngest and smallest of the online networks, began operations in1977. It is characterized by its affiliation with the Washington State Library, its emphasis on service to public libraries and its concentration on the development of replicable software. Because of its strong ties to the State Library, WLN has never shown any inclination to compete with OCLC in the nationwide delivery of services and operates a continuing network system for libraries in the Pacific Northwest only. It has, however, invested over six million dollars in software development since the late 1960s. (Robinson, 1980) It provides not only an online cataloging capability, but also an acquisitions subsystem with fund accounting.

Some observers feel that the WLN approach with its concentration on replicable software may be the wave of the future. "As existing network organizations gain further organizational and financial maturity, and as the costs of computer hardware continue to decrease, replication of the WLN system, which would give them a greater measure of independence from OCLC and provide a system with different capabilities, appears to be an attractive alternative for many networks." (Stevens, 1980) This issue will be taken up later in this paper.

Some of the experiments with the MARC formats and tapes took place outside of networks. Several individual research libraries attempted to develop their own systems. These include libraries at the University of Chicago, University of Georgia, University of Massachusetts, Northwestern University, Pennsylvania State University, Stanford University, and the New York Public Library. (Stevens, 1980) Because of the substantial costs involved in maintaining the necessary database and systems most of these experiments have been abandoned. The evolution of one, however, merits special attention.

The Bibliographic Automation of Large Libraries using an On-Line Timesharing System (BALLOTS) was a system originally developed by Stanford University in 1972. In 1975 the costs of running the system led Stanford to make it more widely available and by mid-1978 over 50 libraries in the state of California were using it as a shared cataloging system with 100 others using it to search for bibliographic data.

Meanwhile the Research Libraries Group, Inc. (RLG) was planning the development of a network system which would provide better quality control to the select group of research libraries that are members of RLG. Rather than develop its own software, it decided in early 1978 to adopt the BALLOTS system because of its sophisticated capabilities. The BALLOTS Center was subsequently reorganized with service to research libraries emphasized and service to California libraries provided through the California Library Authority for Systems and Services (CLASS). This system is now know as the Research Libraries Information Network (RLIN) and is the bibliographic database and services arm of RLG. In addition to providing cataloging, acquisitions, fund accounting, and serial control, RLIN offers programs in the areas of preservation, shared collection development and management, and shared resources among the research libraries.

In spite of massive grants from the Carnegie, Dana, Hewlett, Mellon, Rockefeller, and Sloan Foundations; a substantial, long term loan from the Ford Foundation; and continuing support from the Council on Library Resources the future of RLG is uncertain. Harvard University has dropped out of the group, for a variety of reasons many members maintain their memberships in other networks, and it is unclear whether RLG will be able to attract additional members without compromising on the quality of its service.

The University of Toronto Library Automation System (UTLAS) offers still another approach to networking. The Canadian library processing center began converting its catalog records to machine-readable form in 1959 and had an online system by the mid-1970s. It is second in size to OCLC and is striving for an integrated distributed network. It provides centralized data processing and locally operated systems. It will run a user's file against MARC tapes, the Bibliotheque Nationale de Quebec, the database of the National Library of Canada, and the National Library of Medicine. Moreover, its software can produce COM catalogs, union lists, cards, and tapes. In 1980 UTLAS acquired its first U.S. customer, the Rochester Institute of Technology.

As the foregoing suggests, it is difficult in describing a movement that is only ten years old to sort the history from the current status. While all of the developments outline above will be discussed at greater length in the next chapter, preliminary information is presented here to demonstrate the extent to which network development has deviated from the directions envisioned at the 1970 Airlie House Conference. These differences and distinctions become even more apparent if we compare the preconditions presented at that conference with the resolution on networking passed at the White House Conference on Library and Information Services held in 1979:

> WHEREAS, library and information services contribute significantly to information resources, and
>
> WHEREAS, access to information and library resources available in all types of libraries is needed and must be equally available to all citizens, and
>
> WHEREAS, all types of library and information centers have resources which can contribute to library and information services, networks, and programs at all geographic levels, and
>
> WHEREAS, resource sharing is now mandated by the information explosion, the advance of modern technology, the rapidly escalating costs of needed resources, and the wide disparity between resources available to individuals by reason of geographic location or socio-economic position,
>
> THEREFORE BE IT RESOLVED, that a comprehensive approach be taken to the planning and development of multi-type library and information networks, including both profit and not-for-profit libraries from the public and private sector, and
>
> BE IT FURTHER RESOLVED, that such plans be developed at the national, regional, and local level to include specific plans for a national periodicals system and the concept of a national lending library for print and nonprint materials, and
>
> BE IT FURTHER RESOLVED, that plans be developed for the coordination of library and information networks and programs which would identify the responsibility for such coordination in the United States Department of Education's Office of Library and Learning Resources (or its successor) and the State library agencies, and such other agencies, organizations, or libraries as are involved in such networks, and
>
> BE IT FURTHER RESOLVED, that control of such networks remain at the State or regional level, and
>
> BE IT FURTHER RESOLVED, that mechanisms be developed to ensure access by all individuals to such networks and programs, and

BE IT FURTHER RESOLVED, that Federal and State funds be made available to continue to support and interconnect existing networks, as well as to develop new networks, and that such funds be designated for network operations and for grants in support of local cooperative action, and

BE IT FURTHER RESOLVED, that all agencies and institutions that provide education and continuing education for library practitioners should offer training in the skills, knowledge, and abilities which will help ensure that practitioners are competent to provide access through these networks in a most effective manner.

From every perspective the Federal role is quite different than had been projected in 1970, and now even the expectations have changed. In place of centralized national planning a comprehensive approach involving individuals at the national, regional, and local levels and even the for-profit sector is called for. Instead of "large-scale federal funding" both federal and state support is expected. The requirement that a national agency "govern and manage the development of a national library network." has been replaced by a resolution that "control of such networks remain at the State or regional level."

CONCLUSION

Embedded in the historical development of networks are characteristics that suggest a different pattern of development for libraries in the future. These characteristics are:

- Well defined role
- Funding appropriate to the role
- Development congruent with political, economic, and technological trends
- Capacity for change

Networks know what business they are in. They are in the communications business. While libraries traditionally collect and preserve materials and encourage their clienteles to make use of those materials, networks seek, find, and deliver information. They provide services that not only increase productivity but also enhance and change the nature of library service.

Although financial support for network development has come from a myriad of sources, network operations are usually supported by fees for service. This provides a funding base that is tied directly to services provided and ensures sensitivity to market demand.

The Final Report of the White House Conference on Library and Information Services summarizes the major goals contained in the resolutions: "to reshape library and information services to serve the people in more useful ways, to maintain local control of these services, and to insist on more economy and accountability from the institutions that provide the services." These goals are consistent with the broader political and economic trends of the country and are congruent with network development. Networks have developed from the "bottom up" and control has been retained by local and regional units. Moreover, networks were initially formed for the purpose of taking advantage of economies of scale, and accountability is unavoidable given their funding structure.

A complete description of technological change is outside the scope of this paper. By their definition, however, networks are inextricably wed to computer and communications technologies.

While skill in using these technologies may vary from network to network, networks generically provide electronics based rather than paper based services.

Finally, networks have already demonstrated the capacity to change the nature of their services as conditions change. Although increased cataloging productivity was the primary motivating force in their formation, they now provide bibliographic databases that are used for interlibrary loan transactions and other resource sharing activities. In addition other services are now being developed. OCLC, for example, has experimented with direct delivery of services to the public in Columbus Ohio through its Channel 2000 project.

The preceding analysis does not mean that networks are without problems or that their future is secure. It is simply a summary of the trends and characteristics that have emerged over the last decade. The following chapter will detail the current status of library networks. It will describe them, outline the functions they perform, and analyze the issues they face. Subsequent chapters will define and describe the federal role in greater detail.

CHAPTER II

CURRENT STATUS

Library networks, as defined in the preceding chapter, are technology driven. They are an embodiment of technological capabilities, they respond to technological change, their structures reflect technological trends. Because library networks are tied so closely to technological developments which are occurring at a breathtaking rate it is difficult to describe "the present." Nevertheless, this chapter will provide a snapshot of library networks as they exist today. It will describe the technology, the varieties of networks currently in operation, the functions they perform, and the major issues that arise.

TECHNOLOGY *

Just as technological developments ten years ago led to the initial creation of networks and to their centralization, current technological developments are threatening some networks, changing the functions of others, and creating the possibility of direct service to individuals outside the library.

From a technological perspective a network may be defined as "nodes" joined by "links". Thus, a library network as defined earlier consists of nodes (libraries, local library systems,

---

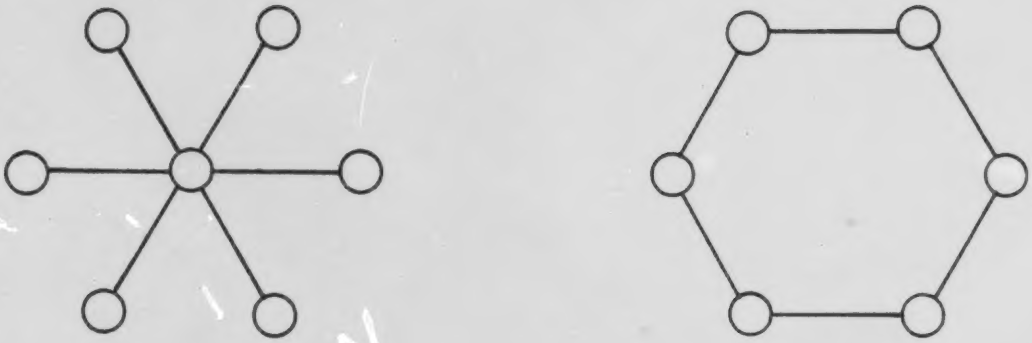
* This section is excerpted from an article to be published by Robert M. Mason on State Library Networks in Library Journal in 1982.

information and service centers, etc.) that communicate machine-readable data through telecommunications links.

Computer-based library networks are designed using three basic communications concepts and two basic data processing structures. The "star" communications approach consists of a central node with communications links (spokes) to outer nodes. The "ring" design has adjacent nodes linked to each other in a chain fashion, and the "direct link" approach provides direct communications links between every node pair, using either a unique link between each node pair or a "communications bus" approach. Figure 1 illustrates the three basic communications design concepts and the two approaches to providing direct links between nodes.

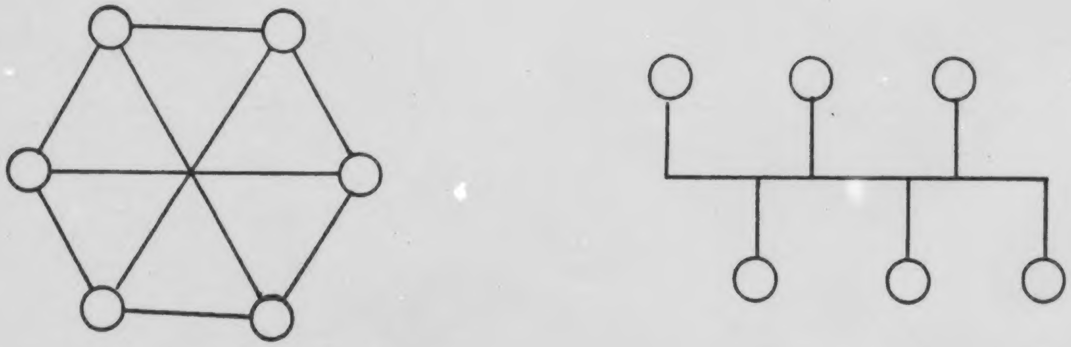
The data processing concepts include "centralized" and "distributed". In the centralized design, the nodes communicate with a central node which incorporates virtually all the computation, memory, and data processing facilities. In the distributed design, the individual nodes themselves have significant processing and memory capabilities.

The star design lends itself to centralized processing of transactions, and the early examples of computer-based library networks are based on a star communication design with a centralized processing facility. More recently, increasing attention is being directed toward distributed processing in a star or bus communications design, in which the individual nodes carry a share of the processing load. A knowledgeable design choice requires not only an assessment of the economics of each approach, but also the matching of desired network functions with



STAR

RING (LOOP)



INDIVIDUAL NODE-PAIR LINKS

BUS

DIRECT

FIGURE 1. Basic Alternative Communications Designs

the system performance characteristics. The paragraphs below outline the distinguishing characteristics of the different approaches.

Star, Centralized

The star design structure is often used to link a more powerful computer facility with lesser or subordinate facilities. In these designs, the nodes may only be communications facilities, with all the logical processing and storage capabilities being located at the central facility (hub). This design has the advantages of relatively low investment requirements at the nodes, close control of the technology and communications protocols (thus assuring a minimum of compatibility problems within the network), and minimum redundancy. It is particularly well-suited for applications which require shared use of costly equipment or other resources. This design has the potential for having the best cost-performance capability of any of the network structures, depending on the functional requirements of the network. The disadvantages of this design are characteristic of most centralized systems: the reliability of the system is no greater than the reliability of the central facility. When the central facility is down, no processing takes place and the entire network is effectively "down". Additionally, any communications link failure means that the isolated node can not perform any of the desired functions even if the central facility is operational.

Applications which have a requirement for remote access to

27

a single database or to a single piece of equipment are amenable to a star, centralized design. Access to a common database makes the star structure particularly appropriate for shared cataloging applications, and OCLC and other cataloging utilities typically are set up as star structures. Statewide networks are likely to incorporate at least some aspects of star networks in order to facilitate the sharing of resources through a statewide bibliographic database. Such a database can be stored and maintained at a central location without the expense of storing and maintaining it at each node.

Ring

The ring design, often seen in a small or local network, typically links nodes that have some processing and storage capabilities of their own. Communications are more limited than in other networks, since each node can communicate with only two other nodes. This design has the advantage of a simple communications protocol; messages that are not addressed to a node are simply relayed to the next node. Similarly, the communications facilities requirements are relatively simple, with two-way links (and possibly even one-way links) between adjacent nodes.

The design has an analog in the local interlibrary loan networks which pass an ILL request to the next library in a ring. The receiving library fills the request if possible; if not, it passes the request on to the next library in the predetermined sequence.

The disadvantage of the design is the inflexibility and inherent limitations of the procedures and communications. The simplicity of the design and procedures means that for networks consisting of more than three nodes, a node can only communicate with some nodes through other nodes, who serve to relay the messages.

Bus/Distributed

A distributed network is characterized by each node having significant capabilities for information processing and storage. Such nodes frequently are joined through a common data communications link, or bus. This reduces the communications link requirement but requires that only one node transmit at a time unless a broadband, frequency-multiplexed design is used. Different procedures can be used to avoid simultaneous transmissions. If one of the nodes represents a more powerful shared processor, it may be set up to poll the other nodes and signal one of them to transmit when it is ready. Different methods are used when there is no hierarchy among the nodes, but a typical approach is the procedure used by DIX/Ethernet, the bus communications standard proposed by Digital Equipment (manufacturers of minicomputers), Intel (integrated electronic chip and microcomputer manufacturers), and Xerox (the copier firm, now offering office automation systems as well as computers). Each node "listens" when it begins transmitting. If it detects a simultaneous transmission, it (along with the other transmitting node) stops and waits for a random interval before attempting to transmit again.

The bus structure reduces the cost of communications links and permits each node to communicate with every other node. It requires that all nodes use compatible communications protocols. It is a particularly useful structure for local networks and can be used in a hierarchical structure with several nodes sharing a single resource.

Star/Distributed

The star communications design, used with a distributed processing network approach, has advantages for state networks. Use of a central node facilitates the creation and maintenance of a statewide bibliographic database without the cost of storage of the complete database at each individual node. In addition, the central node can be used to relay messages between other nodes, thus reducing communications costs. By having storage and processing capabilities at each node, the local library (or library cluster) can maintain a local (area) catalog and perform functions such as circulation without communicating with the central node.

Summary

The economics of the distributed system design are improving with recent technology trends. Large scale integrated circuit technology has progressed rapidly over the past decade, reducing the costs of digital memory and logic circuitry. As these costs drop, additional applications of microcomputers are feasible, leading to technical advances and economies of scale in peripheral equipment such as magnetic media storage (particularly disk storage devices). Consequently, although some argue that the economics still favor completely centralized processing, the distributed approach costs are at least competitive. The choice of structures depends on the functions to be performed, the existing resources, and the preferences of the participants.

It is impossible to predict at this point what configuration of networks will result from these technological trends and developments. It is clear, however, that networks will use these new capabilities just as they used technological capabilities ten years ago. From a technological point of view it is most likely that networks will begin to exhibit the diversity presented above.

NETWORKS

As computer based networks have grown in scope and sophistication the need to distinguish among various types of networks has arisen. For purposes of clarity the term "network" will continue to be used as defined earlier to mean the whole range of computer and communications based systems. "Information utility" will be used to describe those networks such as OCLC which provide online services. The term "service center" will be used for those networks such as SOLINET and NELINET which provide cooperative services to member libraries, but also broker the services of the information utilities.

Information Utilities

At the present time there are four major information utilities in operation: OCLC,Inc. (formerly the Ohio College Library Center), Research Libraries Information Network (RLIN), the University of Toronto Library Automation System (UTLAS), and the Washington Library Network (WLN). Since most large and medium size libraries purchase services from one or more of these utilities they are basic both to networking activities and to library services in general. The preceding chapter outlined the history and development of these networks. The following section summarizes information about the size and scope of each, functions performed, source of funding, management and governance structure, and major issues. A subsequent section will examine the degree of cooperation and competition among the utilities and assess the relationships between them and the service centers.

OCLC

Founded in 1967, OCLC,Inc. is the oldest and largest of the automated library networks. It began online operation in 1971 and now provides service to over 2500 libraries of every type located throughout the country. Its shared cataloging system originated with MARC tapes but permits member libraries to add bibliographic records of materials not found on the tapes. Since its inception over six million records have been added in this fashion making the OCLC database the largest available from any of the utilities. In the area of catalog card production the system has grown from 5000 cards per week in 1971 to 2.5 million cards per week in 1980. (Martin, 1981)

In addition to providing shared cataloging and card production services, OCLC is working to develop new services. An interlibrary loan capability is now available, acquisitions and serials control are now being tested, and a union list is being developed. The use of videodisk for storage is being explored and experiments in direct delivery of information to the individual user have taken place in the Channel 2000 project in Columbus. OCLC recently strengthened its research and development functions by dividing the Research and Development Division. Now the Development Division concentrates on new products and services while the Office of Planning and Research focuses on overall planning. (Robinson, 1980)

The primary sources of revenue for OCLC are fees for services paid by member libraries from their operating budgets. Total revenues for fiscal 1980 were $27 million. This represents average receipts from all users of $12,000 per year. Construction of its new building was financed by the sale of bonds, and some special development projects (such as the now defunct CONSER project) are underwritten by foundations.

OCLC has always been an Ohio nonprofit corporation. Until 1977 its membership was limited to participating Ohio libraries which elected the Board of Trustees and had the power to amend the Articles and Code of Regulations. After OCLC changed its organizational and governance status to become OCLC,Inc. membership was opened up to participating libraries across the country. The Board of Trustees was expanded from nine to fifteen with six elected by a Users' Council. While the Board has sole power to initiate amendments to the code and articles, any changes must be ratified by the Users' Council whose members are elected by member libraries. (Carlile, 1980)

Issues confronting OCLC may be divided into three groups: 1) those characteristics of the system which provide an opening wedge for competitors, 2) trends in technology and other changes that effect the operation of all information utilities, and 3) the relationships between OCLC and state and regional networks.

The quality of the database has been particularly troublesome. OCLC has taken the melting pot approach and some members have complained about the lack of authority control. It is this characteristic that led to the establishment of RLIN. Poor response time and the failure to deliver additional services as promised have caused some libraries to question the advisability of maintaining a single central computer system at a remote location. Replication of the system at other sites is being examined both within OCLC and outside of it. This has brought increasing attention to WLN and its software.

Recent conflict concerning ownership of machine-readable data and the aborted attempt on the part of SOLINET to use WLN software in conjunction with the OCLC database have focused attention on the relationships between OCLC and service centers. This is an issue that goes far beyond OCLC in its ultimate impact, but since OCLC is the largest utility it is more involved than the other utilities in these evolving relationships.

RLIN

Unlike OCLC, RLIN serves a limited group of libraries. RLIN was formed in 1978 by the Research Libraries Group (RLG) to provide major research libraries with a high degree of authority control in the database. All of RLIN's twenty-six full member libraries are also members of the Association of Research Libraries.

Although it is restricted in membership RLIN provides a broader and more sophisticated range of services than OCLC. Its searching capability is especially powerful and software facilities are considered to be its strongest features. (Martin,

1980) In addition to providing cataloging support it provides software for acquisitions, fund accounting, and serial control. Moreover it has cooperative programs in the areas of preservation, shared collection development and management, and shared resources among the research libraries. (Robinson, 1980)

Like OCLC, RLG is a nonprofit corporation. Unlike OCLC, however, its members are its owners. RLIN has never been self-supporting. To date it has relied on massive grants from foundations to stay afloat. In 1979 a study indicated that RLG required 25-30 members to achieve financial stability. In view of the restrictions RLG places on membership and the fact that many current and potential members are affiliated with other networks it is unclear whether or not RLIN can achieve financial independence.

The primary issue for RLIN is survival. The question is whether RLIN can retain its present membership and attract enough additional members to achieve financial stability without sacrificing the quality of its database. Other issues of concern to RLIN have to do with relationships with OCLC and WLN. Several cooperative projects have been proposed, but so far none have materialized.

WLN

While RLIN restricts full membership to ARL libraries, WLN restricts online service to libraries located in the Pacific Northwest. At the present time 21 public libraries, 39 academic libraries, three state libraries, and two others are members of WLN. The database is smaller, with only 1.5 million records, but authority control is unusually good and provides more uniform records. In addition, WLN offers more system features than other utilities. These include online cataloging with subject access, an acquisitions subsystem with fund accounting, and a minicomputer-based circulation system that can be linked to the other WLN subsystems. WLN plans to enhance existing systems by adding refinements such as extended automatic checking of authorities and book ordering and invoicing via magnetic tape. Three additional subsystems that are under development or in design are: detailed holdings, interlibrary loan, and serials control.

Instead of competing with OCLC in the development and maintenance of a nationwide database, WLN has chosen to invest in the development of transportable software systems. Thus the system is unlikely to suffer from the overload problems which characterize OCLC, and widespread adoption of the software could radically change the nature of networking away from the OCLC model. Already WLN software has been purchased for use by the National Library of Australia, and SOLINET has signed a contract with WLN to adapt its software to Burroughs equipment and test it in the Southeast.

Since WLN is affiliated with the Washington State Library and is headquartered there it is subject to more government regulations than other systems. At the same time it has received more government support for system development. Like other utilities, operations are supported by fees for service which are considered high in comparison to other utilities. These higher fees are necessary to provide the additional features and increased quality control.

WLN has been called "the ideal networking system." (Martin, 1981) Nevertheless it faces several issues. One is the cost. As attractive as the features and quality control are, it is unclear to what extent libraries are willing to pay for them. The governance structure is another concern. Control by the state of Washington may hamper distribution of the system. The overriding issue, however, is really beyond a simple consideration of WLN. Networks are rapidly approaching a point at which decentralized systems are economically feasible. Minicomputers and microcomputers are prevalent and powerful, telecommunications costs are rising, and the need to move toward document delivery systems is apparent. These trends may move libraries toward use of WLN software.

UTLAS

Although UTLAS is almost as old as OCLC, it is not well known in the United States. It serves over 200 libraries throughout Canada with a database of over 5 million records which originate primarily from MARC and the University of Toronto. The goal of UTLAS is an integrated library system with a wide range of services. A minicomputer circulation system which interfaces with the master bibliographic file in Toronto is already available, the system includes an acquisitions and process control module, and a serials management system is being developed. In addition, users may contract for microform or book catalogs as well as cards.

UTLAS claims no ownership of the bibliographic database, and each user owns its own information. This creates confusion in pricing because each library may assess a royalty when its records are used. This factor and an unstable basic pricing structure make annual costs unpredictable.

Issues confronting UTLAS include some apparent unhappiness on the part of some users with the management and governance structure, and the awkward pricing structure referred to above. Although UTLAS is primarily Canadian, information is presented here because it is moving into the United States and it is likely to have some impact on other systems.

Service Centers

The most familiar type of network is the state and multistate "service center." The first of these networks grew from existing cooperatives such as Five Area University Libraries (FAUL) and the New England Library Information Network (NELINET). Most, however, have been formed in the last decade in response to the growing need for resource sharing. These organizations typically do not possess their own computer resources but broker those of an information utility, generally OCLC. They also provide a variety of other services to member libraries. These services may include: reference assistance, interlibrary delivery of materials, consulting, continuing education, reciprocal borrowing coordinated acquisitions, and preservation programs. There is tremendous diversity among these service centers in services offered, geographic range, source and level of funding, and governance structure.

Although grouped together for purposes of discussion, state and multi-state networks have some differences which are becoming increasingly important. First, multi-state networks tend to provide fewer services than state based networks which are more active in document delivery, cooperative acquisitions and other services which flow from geographic proximity. Second, state based networks have a stronger commitment to including all types of libraries in their service programs, while regional centers concentrate on high volume libraries. Third, there appear to be significant differences in legal structures and sources of financial support. Most multi-state networks have adopted the nonprofit corporation model, while state efforts are generally affiliated in some way with the state library agency. Thus, multi-state networks receive most of their support from user fees, as do the utilities. State networks, on the other hand, receive a greater amount of governmental support. (Rush, 1981)

Because service centers have developed independently in response to local needs, there is considerable geographic overlap with state and multi-state networks frequently competing with each other to serve libraries in a given location. While the geographic pattern of network operation appears relatively stable at this moment (see Figure 2), it is unlikely that the situation will remain stable. The recent emergence of new state networks suggests that there may be a move in the direction of increased localization. The impact of such a development on regional networks is unclear.

The complexity of network development is further reflected in the variety of funding sources. In 1979/1980 approximately $10,000,000 was spent in support of state and multi-state network

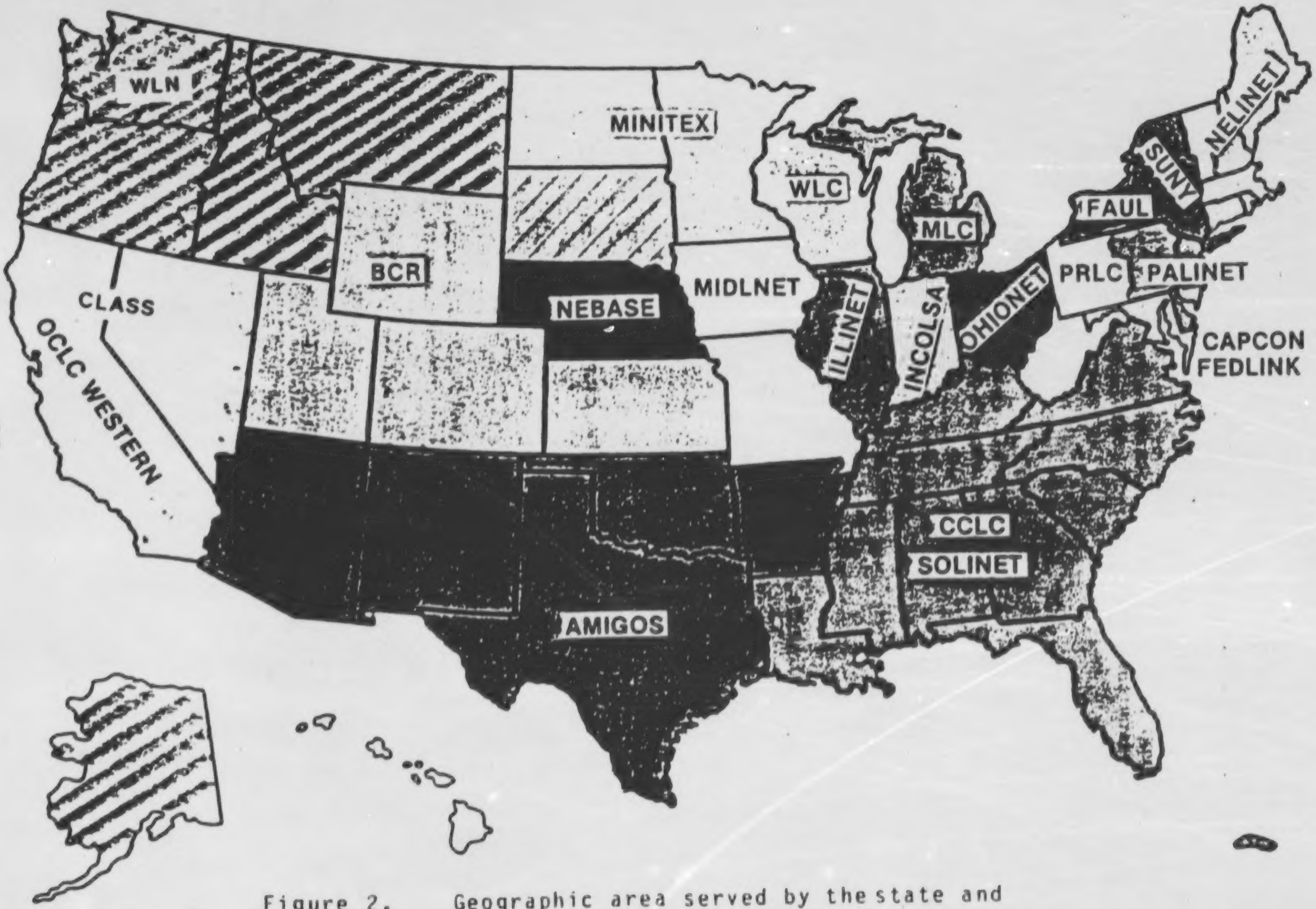

WLN
MINITEX
NELINET
SUNY
WLC
MLC
FAUL
BCR
NEBASE
MIDLNET
CLASS
PRLC
PALINET
ILLINET
INCOLSA
OHIONET
CAPCON
FEDLINK
OCLC WESTERN
CCLC
SOLINET
AMIGOS

Figure 2. Geographic area served by the state and multi-state networks

(Source: Stevens, 1981)

activities and over $40,000,000 was funneled through them to national information utilities. Most of the operating revenue is derived from membership fees, and fees for services, but external funding is required for research and development. Some networks receive additional monies from state funds, or from federal funds administered by the state. Other networks have received grants directly from the federal government and from foundations. These funding sources and their impact on network development will be explored in greater detail in a later chapter.

At the present time 21 state and multi-state service centers serve over 2,500 libraries. The following chart lists the approximate percentage of total libraries served by type of library:

Type of Library	Percent Served
College and University Libraries	61%
Public Libraries	15%
Special Libraries (not for profit)	7%
Special Libraries (for profit)	3%
State Government Libraries	1%
Federal Government Libraries	12%
School Libraries	0.7%
Library Schools	0.7%

(Source: Rush, 1981)

Other characteristics of state and multi-state service centers may be found in Table I. Although they do not appear on the chart at least half a dozen states are exploring the feasibility of establishing state networks. Should these state organizations decide to do their own brokering, regional networks

Table 1. Service Centers/Networks (Source: Robinson, 1980, and Martin, 1981)

Abbreviation	Full name and Headquarters Location	No. of States Served	States Covered	No. of Member Libraries	Remarks
AMIGOS	AMIGOS Bibliographic	7	Arizona, Arkansas, New Mexico, Oklahoma, Texas	171	Soon to come online, Universidad Ibero americano, Mexico City. AMIGOS offers, in addition to OCLC training and consultation, retrospective conversion, processing of magnetic tapes, and consulting for Latin American libraries.
BCR	Bibliographical Center for Research, Denver, Colorado	8	Colorado, Idaho, Iowa, Kansas, Montana, South Dakota, Utah, Wyoming (1 member in Virginia)	126	BCR offers the usual OCLC services and also supports a regional union catalog union catalog and information retrieval services. One of two service centers having a formal relationship with RLIN.
CAPCON	Capital Consortium Network originating out of the Consortium of Universities, Washington, D.C.	3	District of Columbia, Maryland, and Virginia	42	
CCLC	Cooperative College Library Center, Atlanta, Georgia	11	Alabama, Arizona, Georgia, Louisana, Missippi, North Carolina, South Carolina, Tennessee, Texas, Virginia (2 members in Puerto Rico)	38	CCLC is a network that is unlike other OCLC-affiliated networks in that all of the processing for member libraries is done in the network office; none of the libraries has its own terminals.

Table 1. Service Centers/Networks (cont.)

CLASS	California Library Authority for Systems and Services	2	California and Nevada	278	Primarily a state network, brokers both OCLC and RLIN services. Also provides online reference services and assists libraries with with use of microcomputers.
FAUL	Five Associated University Libraries, Syracuse, New York	1	New York	38	
FEDLINK	Federal Library and Information Network, operating out of the Federal Library Committee, Washington, D.C.	41 and District of Columbia	FEDLINK is not in: Connecticut, Delaware, Hawaii, Iowa, Maine, New Hampshire, Vermont, South Dakota, Wyoming	250	All are federal libraries and vary in size from the Library of Congress to some very small Department of the Interior libraries. Many FEDLINK members access OCLC through dial access terminals rather than through the OCLC model.
ILLINET	ILLINET Bibliographic Data Base Service, Springfield, Illinois	1	Illinois	143	ILLINET members are very active in interlibrary loan loan and the ILLINET Users Group is an effective forum for channeling member concerns through the network office to OCLC.
INCOLSA	Indiana Cooperative Library Services Authority, Indianapolis, Indiana	1	Indiana	85	INCOLSA's OCLC libraries are involved in building an online Indiana Union List of Serials which will eventually be part of OCLC's Union List.

Table 1. Service Centers/Networks (cont.)

MIDLNET	Midwest Region Library Network, Green Bay, Wisconsin	3	Iowa, Michigan, Missouri	30	While MIDLNET's network headquarters office is located in Green Bay, it has no Wisconsin members and OCLC coordination is done from the St. Louis office.
MINITEX	Minnesota Interlibrary Telecommunication Exchange, Minneapolis, Minnesota	3	Minnesota, North Dakota, South Dakota	76	MINITEX coordinates OCLC services for its libraries and supports the Minnesota Union List of Serials which has become part of the OCLC database.
MLC	Michigan Library Consortium, Detroit, Michigan	1	Michigan	66	
NEBASE	Nebraska Library Consortium	1	Nebraska	18	
NELINET, Inc.	NELINET, Inc. (formerly the New England Library Information Network), Newton, Massachusetts	6	Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont	163	NELINET was part of the New England Board of Higher Education. Now a seperate organization it offers OCLC suppot services and plans to provide additional services with NELINET's own computer system.
OCLC Western	OCLC Western Service Center, Claremont, California	4	California, Hawaii, Oregon, Washington	122	An administrative arm of OCLC, Inc.

Table 1. Service Centers/Networks (cont.)

OHIONET	OHIONET, Columbus, Ohio	1	Ohio	153	OHIONET is both OCLC's oldest and newest network. The 153 Ohio member libraries belonged to OCLC directly until a governance change in 1977 at OCLC required that the Ohio members be represented as other OCLC libraries are, through regional network affiliation.
PALINET	Pennsylvania Area Library Network, Philadelphia, Pennsylvania		Delaware, District of Columbia, Maryland, New Jersey, Eastern Pennsylvania	141	In addition to providing OCLC support services, this network offers a magnetic tape management program and a union catalog service.
PRLC	Pittsburgh Regional Library Center, Pittsburgh, Pennsylvania	3	Maryland, Western Pennsylvania, Virginia	56	Besides OCLC services, PRLC's Clearinghouse offers location services based on several catalogs, the OCLC terminal, and soon RLIN.
SOLINET	Southeastern Library Network, Atlanta, GA	10	Alabama, Florida, Georgia, Kentucky, Louisiana, Missippi, North Carolina, South Carolina, Tennessee, Virginia	277	SOLINET is the largest and most advanced OCLC network. It has Burroughs computer equipment and recently purchased WLN software. SOLINET members are able to obtain COM catalogs through the network and look forward to an online library network based on member libraries' OCLC tapes.

Table 1. Service Centers/Networks (cont.)

SUNY	State University at New York/OCLC Network, Albany, New York	1	New York	168	SUNY's OCLC members also participate in SONAC, an advisory committee, and can subscribe to a collection development analysis service that SUNY provides to any library with OCLC archive tapes.
WLC	Wisconsin Library Consortium, Madison, Wisconsin	1	Wisconsin	52	The network is affiliated with WILS (Wisconsin Interlibrary Loan Service) and as such provides support services for OCLC libraries in cataloging, interlibrary loans, and other OCLC endeavors.

may find themselves without a clearly discernable role. On the other hand, regional networks themselves are growing in power and may very well compete with the utilities in the near future.

ISSUES

Networks have evolved from organizations established primarily to increase library productivity to systems of bibliographic control and resource sharing. As they develop further, increasing attention is focused on the document delivery capability of networks. These evolutionary trends coupled with technological change which provides storage and retrieval capabilities at the state or regional level may markedly change the nature of library networks. Thus the most critical set of issues are those that have to do with the roles of information utilities, state and regional service centers and the interrelationships among them and between them and other stakeholders. The question which is basic to this set of issues is the degree of centralization or decentralization that is desirable as the networking functions change.

Flowing from this enunciation of purpose there are four major issue clusters: research and development, governance and finance, management, and planning and policy making. Some of the questions involved in research and development are: Who does it? Who pays for it? To what extent is it shared? Governance and finance questions include: What are the characteristics of an ideal governance structure? Do they vary with the type of network? To what extent should services be subsidized? Management issues include not only the familiar questions about allocation of resources, but also involve the degree to which a network can be expected to cooperate with another in a competitive environment. Finally planning and policy making is perhaps the stickiest area of inquiry. The most critical issues here have to do with the setting of standards, the desirability of a "national library network," and the appropriate agency or agencies for coordination national planning efforts.

CONCLUSION

This chapter has described the current status of library network development and has outlined some of the most critical issues. The following chapter will describe the federal sector and and examine the current role of concerned agencies. Subsequent chapters will examine the clusters of issues outlined above from the federal perspective. The central, overarching issue from which all the others flow, however, is how and to what extent should the federal government participate in library network development.

CHAPTER 3

THE FEDERAL SECTOR

The Federal government may be described as a giant information processing machine. It is the largest information producer and distributor in the country, has regulatory authority over communications systems necessary for the distribution of information, and is responsible for the setting of information policy, however one defines that elusive term. The purpose of this paper, however, is not to describe all of the information related activities of the Federal government, but to look quite specifically at the federal role in library networking. Thus, some large and important agencies such as the Federal Communications Commission (FCC), The National Technical Information Service (NTIS), the National Telecommunications and Information Administration (NTIA), the Smithsonian Science Information Exchange (SSIE), and the Institute for Computer Sciences and Technology (ICST) will be omitted from the discussion.

While previous chapters have described the history of network development and the current status of library networks, this chapter will look at networking from the perspective of the various Federal agencies which have been involved in these efforts. As noted earlier, most networking issues may be grouped into four issue clusters: research and development, governance and finance, operation and management, and planning and policy making. Subsequent chapters will examine the federal role in each of these issue areas. The following sections, however, describe each of the agencies that have an interest and a role in the development of library networks. These agencies are: Library of Congress, National Commission on Libraries and Information Science, National Science Foundation, National Library of Medicine, National Agricultural Library, Federal Library Committee, Office of Libraries and Learning Technologies, and the National Endowment for the Humanities.

LIBRARY OF CONGRESS

The role of the Library of Congress (LC) has always been ambiguous. Most Members of Congress feel that the library ought to be just what its name implies, the Congressional Library. Members of the library profession on the other hand feel that LC ought to function as our national library. The fact of the matter is that the Library of Congress is neither authorized not funded to function as a national library. At the same time, the sheer size of its collection (which approaches 50 million items including books, manuscripts, periodicals, pamphlets, and other materials) and the universal impact of its activities places it in a unique and very powerful position.

Traditionally the Library of Congress has recognized its implicit national responsibilities even as it has been careful not to overstep its legislated authority. National activities extend back to the beginning of the century when LC began producing and distributing catalog cards. They continued with the development of the Library of Congress book catalog and the National Union Catalog. They laid the groundwork for the development of library networking activities by developing Machine-ReadableCataloging (MARC) and making it available to those wishing it.

The approach over the years has been consistent, however. LC develops the tools it needs and then makes them available to others, thereby providing a de facto standard and point of departure without imposing a central authority or predetermined structure. Using this approach LC has had a massive influence on the development of library networks. No other Federal agency has had so much power, or used it so cautiously.

Both defenders and detractors feel that the current range of networking activities is a direct result of the non-interventionist position taken by the Library of Congress after the introduction of MARC. Those who feel that greater centralization of efforts is desirable see this as a shirking of responsibility while those who feel that diversity and competition are more significant applaud LC's position.

Although the Library of Congress has been reluctant to assume the central role in the establishment of a "national library network," it has concerned itself with nationwide network development and has supported coordination efforts. In 1976 a Network Advisory Committee (NAC) to LC's Network Development Office was formed. Composed of representatives of networks throughout the country, NAC was originally formed to explore cooperative efforts among networks. With funding from the

Council on Library Resources (CLR), NAC met and worked for more than a year to "identify those issues and problems which must be resolved before the bibliographic component of a national network can be established." (Martin, 1981)

In 1977 NAC issued a report which addressed a number of issues including:

- the goals, assumptions and objectives behind the library bibliographic component of the national network;
- the role of the Library of Congress in the evolving network;
- tasks which should be performed initially in the developing network; and
- the role of authority control of bibliographic records.

(Martin, 1981)

The report concluded that authority control and the establishment of standards are difficult but essential issues, that research and development is required to determine the most effective and efficient approaches to the resolution of numerous issues, and that developmental funding would be required to proceed with further planning and implementation.

A Management Committee was subsequently established to provide overall guidance and direction to program development. A Program Committee was also appointed to assist in the definition of plans and projects. In November 1978 a joint meeting of the Management and Program Committees was called. The results of this meeting were:

1) Identification of three basic, interrelated areas for

further activity:

- design, implementation, and evaluation of a system linking the bibliographic utilities
- determination of which databases would be made available and level of completeness of their records
- design and implementation of a nationwide authority system

2) Expressed need for economic assessment and justification for each project undertaken. (Avram, 1980)

In spite of the avowed intent to cooperate, subsequent studies and numerous meetings of members of the Bibliographic Services Development Program (BSDP) and the Network Advisory Committee and its subcommittees have failed to yield a viable plan of cooperation. As one author who has been intimately involved in these efforts notes: "In spite of these efforts at coordinating networking activities nationwide, there appears at this time to be a politically and economically disjointed library networking community." (Avram, 1980)

Other efforts undertaken by the Library of Congress to promote cooperative networking activities include the COMARC (Cooperative MARC) project and CONSER (CONversion of SERials). COMARC, an attempt to employ cooperative efforts from several libraries for the retrospective conversion of LC records was abandoned in 1978 for lack of funding and inadequate productivity. CONSER, an attempt to amass a database of serials records, was funded by CLR and required the cooperative efforts of LC and OCLC. Initial plans provided for the transfer of CONSER to the Library of Congress in 1977. This has not occurred and the system is currently supported by OCLC.

In its role as a de facto national library, the Library of Congress has joined with the other national libraries, the National Library of Medicine and the National Agricultural Library, in a series of meetings to increase cooperation and resolve differences in procedures. Some topics which have been discussed include cooperation in building an on-line name authority file, cooperative acquisitions, and cataloging.

The Library of Congress appears to be strongest in the areas of technical design and file building. It engages in research and development at the most basic level and establishes standards simply by virtue of the size of its database. Its attempts to assist in coordination have been only moderately successful. They continue, however, and provide at least one forum for debate and discussion. The Library of Congress is clearly not interested in managing a national library network. That fact was abundantly clear during the discussions concerning a National Periodicals Center. Nor does LC wish to provide leadership in the areas of planning and policy making that go beyond the immediate concerns of the Library of Congress.

NATIONAL COMMISSION ON LIBRARIES AND INFORMATION SCIENCE

While the Library of Congress, as a creature of Congress, is constrained in its national planning and policy making activities, the National Commission on Libraries and Information Science (NCLIS) is mandated to perform these tasks. Established through Public Law 91-345 in 1970 the Commission has "the primary responsibility for developing or recommending overall plans for, and advising the appropriate governments and agencies on, the policy....that library and information services adequate to meet the needs of the people of the United States are essential to achieve national goals and to utilize most effectively the Nation's educational resources and that the Federal Government will cooperate with State and local governments and public and private agencies in assuring optimum provision of such services." (P.L. 91-345)

To achieve this NCLIS is authorized to:

1) advise the President and the Congress on the implementation of national policy;
2) conduct studies, surveys, and analyses of the library and informational needs of the Nation, and the means by which these needs may be met;
3) appraise the adequacies and deficiencies of current library and information resources and services and evaluate the effectiveness of current library and information science programs;
4) develop overall plans for meeting national library and informational needs and for the coordination of activities at the Federal, State and local levels;
5) be authorized to advise Federal, State, local, and private agencies regarding library and information sciences;
6) promote research and development activities;
7) submit to the President and the Congress a report on its

activities during the preceding fiscal year, and

8) make and publish such additional reports as it deems to be necessary.

Given such a broad mandate the Commission has conducted hearings, established task forces, and produced numerous reports concerning various aspects of nationwide networking. Most notable is the Commission's program document, **Toward a National Program for Library and Information Services: Goals for Action,** which was published in 1975 after an extended series of public hearings. According to the document major Federal responsibilities are to:

1) Encourage and promulgate standards, including standards for: computer software, access and security protocols, data elements and codes; bibliographic formats, film, computer tapes and sound recordings; literary texts in machine-readable form; and reprography and micrographics.

2) Make unique and major resource collections available nationwide by providing incremental funding to institutions with unique resources of national significance such as Harvard University Libraries and the New York Public Library.

3) Develop centralized services for networking. Examples include: a national audiovisual repository, a national system of interlibrary communication, a national depository for the preservation of microform masters, and a national periodical bank.

4) Explore computer use.

5) Apply new forms of telecommunications.

6) Support research and development.

7) Foster cooperation with similar national and international programs.

The Commission document also recommends increased responsibilities for the Library of Congress which include: 1) expansion of its lending function to that of a National Lending Library of final resort; 2) expansion of coverage under the National Program for Acquisitions and Cataloging; 3) expansion of Machine-Readable CAtaloging (MARC); 4) the on-line distribution of the bibliographic data base to the various nodes of the national network; 5) an augmented reference service to support the national system for bibliographic service; 6) operation of a comprehensive National Serials Service; 7) establishment of a technical services center to provide training in, and information about, Library of Congress techniques and processes, with emphasis on automation; 8) development of improved access to state and local government publications; and 9) further implementation of the National Program to preserve physically deteriorating library materials.

Clearly, many of these recommendations would require special legislation and additional funding. Moreover, in some instances either political or technological developments occurring in the intervening years have rendered the recommendation meaningless. Nevertheless, the basic thrust of the document with its emphasis on centralized federal responsibility and coordination of networks continues.

The National Commission on Libraries and Information Science is a small organization with minimum funding and maximum visibility. It can not provide financial assistance like the Office of Libraries and Learning Technologies, it can not conduct research and development like the Library of Congress, and it doesn't actually produce databases like the National Library of Medicine. Its job is planning and policy making, a job which can be accomplished only through negotiation and consensus building.

NATIONAL LIBRARY OF MEDICINE

The National Library of Medicine (NLM) operates what many feel is a model library network. Officially designated as a national library, NLM serves as the country's chief medical information source. It is authorized "to provide medical library services and on-line bibliographic searching capabilities, such as MEDLINE and TOXLINE, to public and private agencies and organizations, institutions, and individuals. It is responsible for the development and management of a Biomedical Communications Network, applying advanced technology to the improvement of biomedical communications, and operates a computer-based toxicology information system for the scientific community, industry, and other Federal agencies." (United States Government Manual 1980-1981)

NLM has long been a leader in resource sharing and networking activities. **Index Medicus**, the Library's monthly publication of references to biomedical journals, was initiated in 1879 and its Medical Literature Analysis and Retrieval System

(MEDLARS), a computer-based bibliographic system, became operational in 1964.

MEDLARS II now serves over 1000 institutions, over 350 of which are hospitals and health-care institutions. It provides access to over 20 databases, but the bulk of the searches are done on MEDLINE (MEDLARS on-line). Plans are now underway to develop MEDLARS III which is intended to "improve, extend, and integrate both the Library's internal operations (such as technical processing of books and journals) and its external network services. In this latter category, MEDLARS III will provide new capabilities to assist the nation's health science libraries in the creation of bibliographic records, retrieval of bibliographic and text information, access to national holdings and location information, and ordering and delivery of documents." (Banks, 1980)

In addition to the activities described above, the National Library of Medicine administers grants under the Medical Library Assistance Act for a variety of programs. These include: improving biomedical library resources; research in information sciences related to health; training to integrate clinical practice, health research, and education with appropriate computerized techniques; and support of biomedical scientific publications.

Through its Regional Medical Library (RML) Program, NLM coordinates a nationwide network of 11 Regional Medical Libraries and over 100 Resource Libraries. In addition NLM supports library consortia which consist of cooperating health institutions in large geographic areas. The entire Regional

Medical Library network generates an estimated 2 million interlibrary loan transactions each year.

The National Library of Medicine provides a highly specialized set of services to a specific clientele. In so doing it engages in research and development, it provides external funding and even a networking structure, it operates its own network, and by doing all of the above has led the way in planning and policy making. Although NLM is slightly outside of the more general library networking activities which are the subject of the bulk of this report, its influence can not be underestimated. Perhaps its most outstanding contribution is as a model. NLM has shown the library community that "it can be done."

NATIONAL AGRICULTURAL LIBRARY

Not as well known as the National Library of Medicine, the National Agricultural Library (NAL) is our country's second official national library. Like NLM, NAL has developed a family of databases. Agriculture On-Line Access (AGRICOLA) was established in 1973 is now available commercially through on-line vendors.

The National Agricultural Library also coordinates the Regional Document Delivery System, a cooperative effort with land-grant libraries instituted to ensure delivery of information to USDA field personnel.

These and other networking activities make the National Agricultural Library an important agency in library networking. To date, however, its primary accomplishments have been within the Department of Agriculture environment. External activities of most significance to networking are the cooperative efforts alluded to earlier with the Library of Congress and the National Library of Medicine.

NATIONAL SCIENCE FOUNDATION

The National Science Foundation (NSF) is an independent agency of the federal government established by Congress in 1950 to promote the progress of science through the support of research and education in the sciences. From 1958 to 1978 NSF supported activities concerning the transfer of scientific information through the Office of Science Information Service. In 1978 responsibility for the dissemination of scientific information was returned to the research divisions for the specific disciplines supported by NSF and a new division was created to support programs concerned with the "emerging new science," information science. This new division, the Division of Information Science and Technology (DIST) was located in the Directorate for Scientific, Technological, and International Affairs. In 1981 NSF was reorganized and DIST was relocated in the Directorate for Biological, Behavioral, and Social Sciences.

Through this Division the National Science Foundation supports basic and applied research in information science and technology in three related programs: Information Science, Information Technology, and Information Impact. These three program areas replace the five more specific categories which had been used previously: Standards and Measures, Structure of Information, Behavioral Aspects of Information Transfer, Infometrics, and Information Technology. At this date it is still too early to tell how the reassignment of DIST to the Directorate for Biological, Behavioral, and Social Sciences, and the reorganization of the program will affect its activities.

In the past DIST has funded a number of studies that have bearing on network development. Some examples include: the DIALIB study in California, the Fry/White work on scholarly journals, the ANSI Z39 Committee, the Northeast Academic Science Information Center in New England, the King study on Library Photocopying in the United States, and a study of the Economics of Information Transfer Using Resource Sharing Networks - Network Modeling Simulation.

According to the most recent Program Announcement, the goals of the Foundation's Division of Information Science and Technology are:

- To increase understanding of the properties and structure of information and information transfer.
- To contribute to the store of scientific and technical knowledge which can be applied in the design of information systems.
- To improve understanding of the economic and other impacts of information science and technology.

The Information Science Program "is concerned with increasing the fundamental knowledge necessary for understanding information processes." This includes "measures, storage, manipulation, retrieval, coding, and interpretation." The Information Technology Program "is concerned with research on the application of information science to the design of advanced information systems." The purpose of the Information Impact Program is "to gain a scientific understanding of the economic aspects of the production, distribution, and use of information, and of the increasingly pervasive impacts of the diverse applications of advanced information technology."

It would appear that studies concerning various aspects of network development might conceivably fit within one or more of these program areas, but real NSF priorities are unclear. This is partially a result of the general uncertainty that has plagued NSF over the past year. Although funding for DIST has been increased, funding for the agency in general has been cut. Projections for future years vary with the individual doing the projecting.

NSF is a funding agency. Its primary focus is on science. It is not concerned with planning and policy making, network management, or direct funding of networks. Its sole concern as far as network development goes is to provide financial support for research and development activities. In the past its contributions have been useful, and have supported activities for which no other public support existed. The impact of NSF in the future will depend on the amount of money appropriated to DIST and the interpretation of the new program goals.

NATIONAL ENDOWMENT FOR THE HUMANITIES

Another funding agency whose importance to library networking has grown with its budget is the National Endowment for the Humanities (NEH). Created in 1965, NEH is an independent

Northwestern University. Most notable among recent grants has been NEH's contribution to the Bibliographic Service Development Program (BSDP) which was described briefly under the Library of Congress section of this paper. In this effort, NEH joined with the Council on Library Resources and other foundations to provide $5 million in developmental funding. The goals of the program are: "1) widespread availability of bibliographic services, 2) improvement of bibliographic products, and 3) control of the cost of bibliographic processes for libraries." (Avram, 1980)

Just as with the National Science Foundation, the future role of NEH in library networking will depend on its continuing ability to fund important projects. NEH is not directly involved in planning and policy making, nor does it provide networking services. Its mission is to provide the dollars needed for research and development, and to a lesser extent for operations. In the past NEH has proven to be a valuable resource and has supported some critical projects. It has also shown itself willing to join with other funding agencies to provide cooperative support for large undertakings. But the National Endowment for the Humanities is only as strong as its budget.

OFFICE OF LIBRARIES AND LEARNING TECHNOLOGIES

Of all the funding agencies, the one which is by far the most significant in its impact on library networking is the Office of Libraries and Learning Technologies (OLLT) which is at the present time located in the Office of Educational Research and Improvement of the U.S. Department of Education. This agency is charged with the administration of major library legislation including the Library Services and Construction Act (LSCA) and the Higher Education Act (HEA), Titles II-A, II-B, and II-C.

In contrast to the funding agencies described above, monies distributed through OLLT are categorical as well as discretionary. That is, a distributional formula is used and funding is provided to all libraries and library agencies that qualify. LSCA funds are distributed in this fashion. Discretionary grants, on the other hand, are made on a competitive basis. HEA Title II-B funds are discretionary.

Although LSCA and HEA grants are administered differently (see Chapter 4), three characteristics of LSCA and HEA give OLLT a great deal of influence:

1) They provide the major portion of federal grants to libraries.
2) With the exception of HEA II-B, grants are distributed widely to libraries throughout the country.
3) They incorporate legislative and regulatory requirements which can effect change far beyond the amount of money involved.

Because the funding administered through the Office of Libraries and Learning Technologies is so fundamental to network development at the grass roots level, a full discussion of the impact of LSCA and HEA will be found in the section on finance issues. There is, however, persuasive evidence that suggests that the bottom up development of networks can be traced directly to the requirements associated with these monies.

By providing support to the individual library, as opposed to the network, LSCA and HEA grants have encouraged local responsibility in network development. Libraries are given subsidies and incentives are provided for them to use these subsidies for resource sharing. The result has been the growth of services that are respond directly to the needs of the libraries. By employing this method, OLLT does more than provide funding. It has a very real influence on policy making and emerging governance structures.

FEDERAL LIBRARY COMMITTEE

The Federal Library Committee (FLC) is to the Federal Library and Information Network (FEDLINK) what RLG is to RLIN, with the exception that at the current time OCLC services are provided members. FEDLINK is however investigating the possibility of creating an independent federal libraries, machine-readable database and of using network resources other than those of OCLC, so the comparison may be more apt than is immediately apparent.

The FLC is a cooperative organization of over 2600 federal libraries and over 4000 federal librarians that was founded in 1965. Its purpose is to concentrate the intellectual resources in the federal library and library related information community: "To achieve better utilization of library resources and facilities; to provide more effective planning, development, and operation of federal libraries; to promote an optimum exchange of experience, skill, and resources."

FEDLINK is the computer based network serving federal libraries and information centers. It brokers OCLC, BRS, and

Lockheed's Dialog system, and arranges for other database services upon request. In addition, the MARC databases are being extended to include records contributed by the Government Printing Office through FEDLINK and, as mentioned above, FEDLINK is considering the establishment of its own database.

FEDLINK, which is administered by the Federal Library Committee is an operating service center network in the same way that INCOLSA, MIDLNET, and AMIGOS are networks. It is listed in the table of networks to be found in the preceding chapter. It offers services associated with these centers to its member libraries. It is different from other networks in its geographic distribution.

SUMMARY

As the foregoing indicates, the federal role in library networking may be variously described. The two agencies without which networking as we know it would have been impossible are the Library of Congress and the Office of Libraries and Learning Technologies. The Library of Congress developed the MARC tapes and made them available without centralized control or a predetermined notion about how they should be used. The Office of Libraries and Learning Resources provided support to libraries which was used to develop state and regional networks and to buy bibliographic services provided by the utilities.

Research and development continue at the Library of Congress and the National Library of Medicine. It is supported in other institutions by the National Science Foundation, the National Endowment for the Humanities, and the Office of Libraries and

Learning Resources, with additional funding provided by the Council on Library Resources and other concerned foundations. The Office of Libraries and Learning Resources continues to be the only agency that provides operational support.

Major databases from which networks draw are provided by the National Library of Medicine and the National Agricultural Library as well as the Library of Congress. In addition, the two national libraries operate actual networks, as does the Federal Library Committee.

Planning and policy making is the specific mandate of the National Commission on Libraries and Information Science, but the Library of Congress and the Office of Libraries and Learning Technologies probably contribute more to that effort for reasons that will be enumerated in the following chapter. To a lesser extent, all of the agencies described above have some influence on planning and policy making. Any funding decision may be seen as setting policy, and the creation of systems which can be emulated is planning of a concrete type.

The purpose of this chapter has been to describe those federal agencies specifically concerned with library networking from the perspective of the agency itself. In the next chapter the interrelationships among agencies will be explored and the contribution each makes toward resolving issues will be assessed. The issues confronting bibliographic utilities, state and regional service centers, and the individual library will be examined in the light of actual and potential federal contributions to the resolution of those issues. Political and economic trends which effect the capacity of the various agencies to act will also be identified.

CHAPTER 4

THE ISSUES

Previous chapters have described the history and development of library networks, their current status, and the chief federal agencies involved in their development and operation. This chapter will concentrate on the primary issues facing networks today. It will look at the current political and economic environment, the overarching issues that affect federal participation, the main issue clusters described earlier, and the approaches being taken by federal agencies to resolve problems and deal with these issues. The following chapter will evaluate federal activities and suggest future roles in light of past experience and present conditions.

POLITICAL AND ECONOMIC TRENDS

Major goals enunciated at the White House Conference on Library and Information Services were: "to reshape library and information services to serve the people in more useful ways, to maintain local control of these services, and to insist on more economy and accountability from the institutions that provide the services." (White House Conference Report, 1980) Since 1979 when the Conference was held, these concerns have grown and have been reflected in a clear move toward fiscal and political conservatism.

Economically the nation has suffered from the twin evils of inflation and recession. Citizens have responded at the local level by limiting the taxing capacity of local governments, thereby diminishing their ability to provide services. This trend started in California with the passage of Proposition 13 in 1978, but has since spread across the country. The results of these initiatives are well documented elsewhere.

At the Federal level programs have been reduced, consolidated, and in some cases eliminated. Funding agencies which have been instrumental in providing support for the development and operation of networks have found their budgets cut severely, and some are even facing zero funding for FY 1983. Because the numbers for these agencies are so volatile at this time, the analysis that follows will examine past and present contributions to library networking without considering the probable funding level for the future.

In other developments, some of the regional service centers appear to be undergoing growing pains. Reflecting no doubt the generally poor economic conditions as well as a certain confusion about role definition both SOLINET and NELINET have recently reduced staff and announced program retrenchments. The announcement of staff reductions at NELINET was accompanied by the observation that: "Outside forces are moving technology faster than we could ourselves, and restricted library budgets are forcing our members to look differently at their need than they did four years ago." (L.J. Hotline, Dec.14, 1981)

The issue of role definition for regional service centers will be examined in more depth later in this chapter. Information noted above is included here to provide an example of political and economic trends as they are exhibited in the networking world.

THE FEDERAL MANDATE

In spite of the fact that information is generally considered to be a national resource, the move to greater local control and reduced federal support have raised many questions about the legitimate function of the federal government in this arena. Some of these questions are: Is the government assuming a legitimate function of the private sector when it distributes information? Under what circumstances should the government create information resources and networks? Should fees be charged for specific services? Are fees a viable and appropriate mechanism to pay for the distribution of information after the taxpayer has already supported the acquisition of the data? How do we measure the public good to be derived from government intervention? How do we guide and coordinate private sector and government initiatives?

Other questions abound, but flow from the same concern. Given the philosophy that the government should intervene only when the free market fails to operate (a philosophy that is on the ascendancy), what does it mean for library networking activities. While it is not the purpose of this paper to redefine the basis for our federal government, it is important to note that the concerns outlined above exist and become manifest during appropriations hearings. It is therefore realistic to address the basic issue of the appropriateness of federal intervention as we analyze the issues relating specifically to library networking.

NETWORKING ISSUES

Several writers have attempted to identify those issues that are most critical to an understanding of library networks and their potential. One author labels these issues "aspects of the network concept" and includes: interdependence, large-scale bibliographic data base, standards and quality, on-line automated systems, telecommunications, loss of autonomy and shared decisionmaking, all library service, access to all, integration and coordination, one network for all, centralization, top-up/bottom-down, a national capping agency, internationalism, and cost and productivity. (Stevens, 1980) Obviously some of these items are characteristics rather than issues, nevertheless they capture many of the concerns voiced in a less systematic fashion by others. In addition, many of these items recur in other lists.

Susan Martin's list is not labeled "issues" either, but is found in the last chapter of her most recent publication which deals with networks and libraries in the years ahead. It appears to include a great many issues including: links, public access, regionalization, public/private interface, bottom-up development, a network of the future, the network of the 1980s, a nationwide network, and implications for the library. (Martin, 1981)

Still another list is provided by Barbara Markuson. It is clearly called "critical issues in library development," and includes many of the same items listed above: the network revolution, understanding networks, the national library network:

reality or myth?, national planning, the locus of networking, access, standards, evolution, and the network nation. (Markuson, 1980)

Clearly, some of the items listed above are outside the purview of the federal government. The technological developments described by Stevens, the network revolution outlined by Markuson, and the bottom-up development noted by Martin are examples of issues which the federal government deals with only tangentially. Most federal activities in library networking are designed to resolve issues which fall within four general groupings: research and development, management and governance, funding and planning and policy making. Most of the issues concerning the development of a "national library network," or even a "nationwide library network" fall in the funding or planning and policy making groupings.

RESEARCH AND DEVELOPMENT

At the present time the United States spends approximately $60 billion for research and development, with about half of this support provided by the federal government. While this represents a decline from the 65 percent provided by the federal government in the early 1960s, it is the continuation of a long term national commitment to the pursuit of knowledge. A large portion of these monies are spent on national defense and the space program, but a significant amount has been dedicated to general science and other efforts.

Federal support for research and development is based on the recognition that industrial R&D generally focuses on programs that have a low risk and a high, short term payoff. Federal R&D on the other hand concentrates on programs that are of national concern, have little chance of producing direct financial benefits, carry a relatively high risk, and take a long time to produce useful results.

In the area of library and information science $57,974,000 was spent on research and development by federal agencies in the entire decade of the 1970s. In addition the Council on Library Resources, Inc. contributed $5,317,000 and the Carnegie Corporation of New York contributed $3,588,000. This compares with $146 million spent on research by information industries during the single year of 1979.

Although the total annual amount available from all federal government agencies is down to $6,439,000 for 1980 from a high of $19,329,000 in 1974-75, the amount has fluctuated from year to year. Of the seven federal funding agencies which provide funding for library and information research, three provide the major portion of support. Agencies and the total amount of money provided for library and information research for the ten year period of 1970-1980 are listed below:

FUNDING AGENCY	TOTAL (in 000s)
National Science Foundation, Division of Info. Sci. and Tech.	$33,063
Dept. of Ed./ Office of Libraries and Learning Technologies	10,585
National Library of Medicine, Extramural Grants Program	8,127
National Endowment for the Humanities	2,675

Library of Congress, National Lib. Serv. for the Blind and Physically Handicapped	1,720
Dept. of Ed./ National Inst. for Education	1,097
National Commission on Libraries and Information Science	769
TOTAL	$57,974

(Source: Cuadra, 1981)

Research areas which have been funded during this period have reflected the emergence of networks and the need for R&D in network related areas. According to the Cuadra report, the three subject areas receiving the largest amounts of funding in the 1970s were: information retrieval system design and evaluation, management of library and information services and systems, and networking and resource sharing.

Funding for research, however, is not the only way the federal government contributes to research activities. As noted in the previous chapter, significant resources have been devoted to the development of databases at the Library of Congress, the National Library of Medicine, and the National Agricultural Library. By developing the capacity to manage their own collections, these libraries have provided tools necessary for network development. The development of MARC tapes is the most obvious example of the impact of internal research and development. In addition, as they have developed their own networks, like that of the National Library of Medicine, those networks have served as examples.

Barbara Markuson has cited research and development, together with capital acquisition and technology transfer as the most important aspects of the network concept. She has also noted that flexibility, forward funding, and risk capital for research and development are essential factors in satisfactory network funding support. (Markuson, 1980) Miriam Drake has argued persuasively that funding for research and development for networks is an appropriate role for the federal government and likens it to the subsidies provided the airline industry and satellite companies, both of which were initially funded by the federal government. (Drake, 1980)

There appears to be remarkable consistency of support for the concept of federal funding of research and development in this area. Tax monies available for library support are declining. Networks offer a way to increase productivity. Industry efforts are not addressing long term public concerns. The goal of increased productivity is consistent with national funding policies. Nevertheless the amount of money available for these efforts is grossly inadequate by any reasonable measure.

In many high technology industries it is not unusual to find as much as 6%-8% of net sales invested in research and development. Of this amount, the federal government may contribute as much as 50% of the total, and the figure is as high as 84% in the aircraft and missiles industry. (Science Indicators, 1978)

In the information industry, as defined rather restrictively by the Information Industry Association, corporate investment in research and development was $146 million in 1979. Of those businesses reporting R&D expenditures, the average investment was 4% of net sales. During that same year the federal government contributed $7.4 million to research and development in the whole area of library and information science. Based on these figures the federal government invested only 4.8% of the total amount spent on R&D in the area of information, an industry which is fast growing and offers potential solutions to productivity problems.

MANAGEMENT AND GOVERNANCE

Management and governance can mean practically anything, depending on who you are talking to. In this section management and governance refers not to the structure of networks as described in previous chapters nor to the planning and policy making issues connected with the development of nationwide library networking. Instead management and governance is used here to mean the actual operation of specific networks.

As the largest producer and consumer of information in the country, the federal government has developed a number of databases and networks to assist in the identification and retrieval of information. Some of these networks such as those operated by the Library of Congress, the National Library of Medicine and the National Agricultural Library have been described elsewhere. They provide the basis for many other networking activities.

There are, however, other networks which are less well known, but still represent federal efforts in the area of networking. Agencies operating these networks are not necessarily listed in the previous chapter. The following paragraphs provide a brief description of some of these networks. They are excerpted from **Federal Information Sources and Systems**, and are included here to indicate the range of networking activities taking place within the federal government.

Patent Search Files: U.S. Patent and Trademark Office

This system is designed to provide a comprehensive collection of U.S. and foreign patents to be used by patent examiners, patent attorneys, and inventors in search of prior art in relation to filing and/or prosecuting patent applications; by individuals seeking a specific patent; and by the general public in search of technical information. It may be used at the Public Search Room.

NTIS Bibliographic Data File
(Dept. of Commerce)

This file contains over 550,000 bibliographic citations of U.S. Government sponsored research, development, and engineering reports; computer products; and inventions available for licensing. Selected state and local government reports are also included. It is a purpose of NTIS to disseminate to the public information products from U.S. Government agencies. The magnetic tape may be leased annually, and tapes back to 1964 may be acquired. The file is also available through commercial on-line information systems.

At the current time, the Department of Commerce is planning to dismantle the National Technical Information Service in order that private sector firms may take over the marketing of government publications.

Census Bureau Population Statistics System
(Dept. of Commerce)

This file consists of data collected in the decennial censuses. The data are used by the Congress, by the executive branch, and by the public generally in the development and evaluation of economic and social programs. Information in printed form is publicly available.

Library General Information Survey System (LIBGIS)
(Dept. of Education)

This system is designed to collect, process, analyze, and disseminate daa on all types of libraries; on educational broadcasting facilities and programs; and occasionally, on museums. Reports are publicly available. Theoretically these data are updated every 2-5 years, but reduced funding has endangered the continuation of the program.

Educational Resources Information Center (ERIC)
(Dept. of Education)

ERIC is a nationwide decentralized information network for acquiring, selecting, abstracting, indexing, storing, retrieving, and disseminating the most significant and timely education-related reports. It consists of a coordination staff in Washington, D.C. and 16 clearinghouses located at or with professional organizations across the country. The abstract journal is publicly available by subscription from GPO. Most documents may be purchased either in microfiche or paper. This program is currently being evaluated.

Water Resources Scientific Information Center (WRSIC)
(Dept. of the Interior)

The system disseminates scientific and technical information to the water resources community through a variety of services, including a twice-monthly abstracting bulletin, an annual catalog listing of ongoing projects, topical bibliographies, state-of-the-art reviews, and computer searches.

Computer-Assisted Legal Information Storage and Retrieval (JURIS) (Dept. of Justice)

This computerized legal research system provides fast, comprehensive, and incisive retrieval of case law, statutory law, an internal Departmental work product. Used by Department of Justice lawyers, this system is not publicly available because of the expense and contractual restrictions on dissemination of data held under license.

NASA Library Network (NALNET)

NALNET is a cooperative effort by the NASA libraries located at headquarters and 11 research centers, to provide access to over 180,000 books and 6000 journals located throughout the system.

Smithsonian Science Information Exchange, Inc.

SSIE operates and maintains a national data base of information on research in progress. SSIE products and services are publicly available at published fees.

There are numerous other systems in operation within the federal government. The above list serves to illustrate the breadth of efforts. Although the primary purpose of most of these systems is to facilitate internal information management, some of them, such as NTIS and SSIE, provide direct service to the public or to other networks. No specific data are available, but it appears that these efforts consume far more resources than all other government support for networking put together.

FUNDING

In many ways, almost all of the issues arising from a consideration of federal roles in library networking could be reduced to issues of funding. Resource allocation does, after all, have a significant, even critical impact on research and development, the operation of networks, and planning and policy making. Thus, definition becomes once more important. Since earlier sections have dealt with the federal contribution to research and development and federal network operation, this section will be restricted to an analysis of direct operational support of bibliographic utilities and service centers.

To the extent that federal monies are used to support library development they also support library networking. As noted in the previous chapter federal funds are of two types: formula grants and discretionary grants. All of the grants described in the section on research and development are of the discretionary variety. Applications are made for federal support of a specific project and awards are made on a competitive basis.

Formula grants on the other hand are made available to all libraries that meet certain conditions. The principal legislative acts that provide this type of support for libraries are the Library Services and Construction Act (LSCA) and the Higher Education Act (HEA). Both of these acts are administered by the Office of Libraries and Learning Technologies and have had a significant impact on networking development.

LSCA

The Library Services and Construction Act (LSCA) was passed in 1964 to replace the Library Services Act (LSA) originally enacted in 1956 to assist rural areas in the establishment of libraries. Since the very beginning, however, these pieces of legislation have required matching state and local funds and the preparation of a comprehensive state plan. In the years since these bills were first introduced their scope has been broadened to include: service to urban areas, public library construction, improvement of library services for the physically handicapped, the institutionalized, disadvantaged, bilingual, older persons, strengthening major urban resource libraries, strengthening state library administrative agencies, and promotion of interlibrary cooperation. At present four titles of LSCA are authorized:

Title I, Public Library Services. FY 1982 appropriations, $62,500,000

Title II, Public Library Construction. Not funded since FY 1973.

Title III. Interlibrary Cooperation. FY 1982 appropriation, $12,000,000.

Title IV, Older Readers Services. Has never been funded.

The cumulative total of Federal support provided libraries through these acts between 1957 and 1976 was approximately $730 million. This represented less than 5% of the total public library expenditure. Nevertheless this expenditure contributed significantly to the current pattern of public library development. Robert Frase in his analysis of Federally supported library programs concludes: "Public library services have unquestionably been greatly extended and improved, using the funds appropriated under Title I. Since public libraries have traditionally been created and financed primarily by local governments, the quality and even the very existence of public library services has varied greatly, not only between states but within states as well. The Library Services and Construction Act was designed to deal directly with this problem by requiring state plans for coordinated programs designed to meet the needs of all the citizens of each state. The state library agencies have been greatly expanded as a result of the Act, and called into existence where they did not exist before. Systems of libraries have been created to provide better service through cooperative action. Interlibrary loan networks have been established on a state basis. State statutes have come into existence, establishing goals and standards for public library services and authorizing state appropriations." (Frase, 1975)

Of all the accomplishments listed above, none has more long term significance than the growing state responsibility that was encouraged through Federal subsidy. This trend toward an increasing role for the states has been called "one of the potentially most important developments during the past ten to fifteen years in public library systems." (Blasingame and DeProspo, 1970) The most dramatic example of this impact has been pointed out by Joe Shubert. In 1957 state appropriations for public libraries was approximately $5.4 million. By 1974 that figure had grown to $81.7 million. (Shubert, 1975)

The parts of LSCA which have contributed most to library networking are Titles I and III. LSCA, Title I is quite broad in scope and requires state matching funds. While Title I is specifically intended to extend library services to groups of citizens who may be out of the mainstream of public library services and are thus underserved, it does have another purpose as well: "...for extending public library services to geographical areas and groups of persons without such services and improving such services in such areas and for such groups as may have inadequate public library services."

Based on the expressed objectives of Title I, many state libraries have have used these monies to support network development and operation. A recent evaluation of Title I of the Library Services and Construction Act revealed the following:

- Over 56 percent of LSCA I projects involve long term, ongoing activities. Forty-four percent of LSCA I projects have some form of inter-library cooperation involved in their services or in the acquisition of materials.
- Over 62 percent of the states were able to install or upgrade telecommunications linkages among public, academic and special libraries because of LSCA III.
- More than 75 percent of the states actively participated in intrastate and multistate library networks.
- Ninety-four percent of all public libraries (serving an estimated 197.8 million persons) were able in 1980 to cite at least one benefit resulting from the LSCA Title I Program.

The study further noted that among the "most often cited benefits were increased access to resources of other libraries (resource sharing through regional and multitype library systems." (AMS, 1981)

Specifically authorized "for establishing and operating local, regional, state or interstate cooperative networks of libraries," LSCA Title III does not require state matching funds. It, too, is allocated to states by formula, but state agencies have considerable discretion and flexibility in its use within the state. Thus funds may be spent for network design, implementation, operations or expansion. They may also be used by multitype library networking activities and to promote cooperation among all types of libraries. In one evaluation of Title III funding Joe Shubert observed: "The LSCA program placed new and major responsibility on the state agencies...this is particularly true of Title III, which brought state library agencies into a new relationship with university, school and special libraries as well as with the major public libraries. LSCA assisted programs, shaped network development and caused major changes in interlibrary sharing and communications." (Shubert, 1975)

The Library Services and Construction Act is far from perfect. Funding has been uneven and unpredictable, making planning awkward and uncertain. It has, however, contributed to library development and cooperation well beyond the dollars involved. It has provided incentive for state participation in library development, and has thereby stimulated resource sharing activities at the state and local level. Both Titles I and III have contributed materially to network development. Title III has provided direct support specifically to networking activities, and the more general Title I has encouraged resource sharing as part of an overall pattern of library development. The ubiquitous nature of LSCA funding, its requirement that state and local governments provide matching funds, and its strengthening of state library agencies are key ingredients in the growth of library networks.

HEA

The Higher Education Act of 1965 has four sections which contribute to library networking activities:

- o Title II-A, College Library Resources
- o Title II-B, Research and Demonstration
- o Title II-B, Training
- o Title II-C, Strengthening Research Libraries Resources

Title II-B, Research and Demonstration provides discretionary grants which may include support for research and development of networks. A discussion of these monies was included in an earlier section. Title II-B, Training is also a discretionary grant program which provides modest support for scholarships and training institutes, some of which are concerned with networking issues.

Title II-A authorizes formula grants to eligible institutions of higher education for the primary purpose of acquiring books, periodicals, documents, magnetic tapes, phonograph records, audiovisual materials, and other related library materials. Although the legislation provides for three types of grants: basic grants of up to $5,000 for each institution; supplemental grants related to enrollment, programs, and demonstrated needs; and special-purpose grants, the legislation is written in such a way that since 1973 only basic grants have been funded. Moreover, these grants have provided very small amounts of money ($1200 in FY 1981) to a great many institutions ((2,471 in FY 1981) and has been under attack for the last year. The impact of this Title on library networking is largely unmeasured.

In contrast to Title II-A, Title II-C provides large amounts of money to a small number of institutions. This program was enacted through the Education Amendments of 1976 in recognition of the fact that the major research libraries represent the bibliographic foundation of our research resources and that they require financial incentives to participate in resource sharing activities. Grants are made to research libraries for the purposes of "maintaining and strengthening their collections, which are essential to scholarship and research on a national and world-wide basis, and assist them in making their holdings available to individual researchers and scholars and to other libraries whose users have need for such research materials." (OLLT, 1980) Awards are made in three areas: 1) collection development, 2) preservation of materials, and 3) bibliographic control.

Estimates indicate that approximately 200 libraries fall within the definition of major research library. They include institutions of higher education, public libraries, state libraries, and private nonprofit independent research libraries.

Up to 150 grants may be made annually. Regulations are now being revised.

An analysis of grants made in FY 1978, FY 1979, and FY 1980 suggests a definite trend toward increased support of networking activities. The following table shows the distribution of grants among the three program areas for the years listed above:

PROGRAM ACTIVITY

YEAR	COLLECTION DEVELOPMENT	PRESERVATION	BIBLIOGRAPHIC CONTROL/ACCESS
1978	$795,103	$1,340,554	$2,864,339
1979	628,433	1,393,201	3,978,366
1980	839,062	788,919	4,326,743
TOTAL	$2,262,598	$3,522,674	$11,169,448

The commitment to supporting those activities which contribute to resource sharing through networking and bibliographic control is clear, and growing. Although this Title is not generally thought of as a major source of financial support, it does provide some incentive for the larger libraries to participate in cooperative activities.

PLANNING AND POLICY MAKING

Of all the issue clusters considered in this report, the most controversial by far is planning and policy making. For many of those actually involved in library networking, the idea of a "national library network" seems to have fallen out of favor, if indeed it was ever in favor. Thus the notions of a "national plan," or a "federal locus" appear in sharp contrast to the reality of library networking.

As pointed out in earlier chapters, networking activities have grown from the bottom up. They reflect the needs and struggles of local libraries and regional units. The bibliographic utilities and regional service centers incorporate an entrepreneurial spirit that appears to be more comfortable in a competitive environment than it is in a cooperative one.

Nevertheless some cling to the notion that problems can be solved in the meeting room rather than the market place. There is, however, no evidence to support this assertion. As Barbara Markuson puts it: "It is difficult to write of national-level network planning without being unduly critical." (Markuson, 1980) Sue Martin takes a similar position: "Now it appears that the concept of a nationwide network has indeed been overtaken by events. Simply stated, the bottom-up approach works better. The fact is that most librarians are not deeply involved in the development of a national bibliographic network. A large monolithic bibliographic network is no longer an objective useful to the goals of the North American library community. Rather, each library and each network continues to hold its own priorities, fitting into the nationwide jigsaw puzzle as appropriate." (Martin, 1981)

Even Henriette Avram, experienced as she is from working with the Network Advisory Committee has concluded that "In spite of these efforts at coordinating networking activities, there appears at this time to be a politically and economically disjointed library networking community." (Avram, 1980)

In assessing the situation Markuson comments: "Committees, task forces, and studies abound, but the impact has perhaps been so minimal because: 1) the sponsoring agencies are too remote from what is actually happening in networking, 2) the efforts are directed toward ad hoc solutions to isolated problems without prior development of a long-range plan for a national program, 3) too much concern is focused on the political role of institutions and agencies and too little on technical solutions of critical problems, 4) effort is concentrated on present technology and little attention is given to the really significant changes that new technology will bring, and finally, 5) there is not enough attention given to how national-level recommendations and plans will be implemented in the field." (Markuson, 1980)

Taking a somewhat broader view Miriam Drake notes that two assumptions about government have been challenged in recent years. "The first assumption is that government can do some jobs more efficiently because it does not have to make a profit. The recent history of AMTRAK and CONRAIL are clear evidence that government operations do not lead automatically to efficient and better service....The second assumption is that bureaucrats and politicians always act in the public interest. A daily reading of your local newspaper should shatter that assumption." (Drake, 1980)

It is true that NCLIS, LC, NSF, OLLT, and other agencies have sponsored numerous reports and held countless meetings. It is not, however, clear what these efforts have accomplished. The federal government is capable of strong, centralized planning to achieve specific goals. It does so, however, only under one of three conditions:

1) It offers the carrot of financial support

2) It carries the stick of federal regulation

3) It does it itself

In the case of national network planning and policy making none of these conditions prevail. Funding agencies are not charged with planning and policy making. Regulations with teeth that would ensure the enforcement of standards are non-existent. Agencies like the Library of Congress that have done it themselves (with MARC, for instance) have been successful in that undertaking, but have not attempted to control its use.

Planning and policy making in library networking is the thing the federal government does least well. To a large extent the funding agencies are the most effective policy makers, for they can offer financial incentives for specific actions. But even they are limited. In addition, it is not at all clear that the library profession wants centralized planning for a set of services which are developing in response to local need.

The single exception to this may be in the area of standards. Most observers feel that the establishment of hardware and software standards, as well as bibliographic standards will at least not preclude the possibility of a nationwide network developing. Even those who lack enthusiasm about generalized planning are strongly supportive of this objective. "Whatever the shape of future national networking, technical compatibility is of prime importance; the development of standards for content representation, data communication and machine-to-machine communication must be stressed. If an agreed-upon goal is an integrated system which allows the same data to be used for a variety of function, then the various parts of that system must accept the data without requiring extensive manipulation or rekeying." (Martin, 1981)

"Support for development of library and information standards and attention to standards in all aspects of the library field, from the educator in the classroom to the practitioner on the job, is critical to library networks....It is critical that we give attention to better methods for financial support of standards development, documentation, promulgation, review, and training. Although standards are clearly of national concern, no existing library legislation designates any money for standards or even specifically requires adherence to national standards." (Markuson, 1980)

CONCLUSION

This chapter has looked at the major clusters of issues confronting library networks from the perspective of federal involvement. Activities of the federal government have, in fact, been critical in the development of library networks. But the reality of federal intervention has been quite different from the rhetoric articulated ten years ago at the Airlie House Conference.

Centralized planning and policy making has not been particularly effective, while meager financial support has been used as an incentive to develop planning and operational capabilities at the state and local levels. Moreover, the systems which agencies such as the Library of Congress and the National Library of Medicine have developed to manage their own information have been fundamental to networks.

In the area of research and development, federal funding has been significant but insufficient. There are strong arguments which favor an increased federal role in this area. Perhaps the most persuasive of these are based on a consideration of the long term public good that is likely to result from a federal investment in research and development and a recognition of the fact that no private source is likely to provide the level of funding needed.

Many issues have not been discussed in this chapter. Some of the issues which are most critical to library networks are, in fact, not solvable by the federal government. In the following chapter, these issues will be noted, and present and potential federal roles flowing from the above analysis will be presented.

CHAPTER 5

FEDERAL ROLES AND THE EMERGING NETWORK ENVIRONMENT

The previous chapter outlined networking issues of specific concern to the federal government. This chapter will examine the roles that flow from that analysis and suggest future strategies for federal agencies. It will also briefly describe those issues that are not vulnerable to direct federal intervention and describe the probable direction of network development. Finally the chapter will examine the potential federal posture in this emerging environment.

FEDERAL ROLES

Defining the appropriate role for the federal government in any specific area is probably impossible today given the changes which are occurring in our society. One thing is sure, however. The federal role depends to a great extent on the goal and objectives which one wishes to achieve and the availability of other resources.

For library networking, there is a vast difference between a nationwide library network and a national library network. The role of the federal government will be significantly different depending on which direction is taken. But in this instance the goal and objectives depend on more than what the majority wants to achieve. It also rests on a history and set of conditions that exist.

Library networks have grown from the bottom up. They are driven by technology and nourished in the political and economic culture of the times. Historically they have been responsive not to a national directive, but to a local imperative. Social and economic trends serve to reinforce this trend toward locally funded and managed systems requiring minimal intervention by the federal government. At the same time technology is giving us smaller, faster, cheaper computing power. The dream of a computer in every library is much closer than we once believed possible. This is creating a situation in which local networks have not only a political appeal, but an economic one as well. As networks move beyond increasing productivity and providing bibliographic access to actually delivering information, the appeal of smaller systems will increase.

For the federal government this suggests that an appropriate goal might continue to be increasing access to information. This has after all been the goal of federal intervention since the Library Services Act sought to bring library service to the rural parts of our country. Objectives, however, might shift quite dramatically. Instead of striving for a centralized system, with some services provided by federal agencies, a distributed system begins to make more sense. Instead of seeking a "locus of Federal responsibility," the shared responsibility outlined in the White House Conference resolution might become a better objective.

Based on the information detailed in this paper, it appears that some reasonable objectives for federal participation in library networking might be:

- Encourage the development of state and local networking capabilities by providing financial incentives for resource sharing
- Encourage the continued participation in networking activities by major research libraries by subsidizing resource development
- Support research and development at an elevated level to achieve economies of scale, increased productivity, and advances in information technology that might even effect other parts of the economy
- Promote use of the latest technology within the government itself, so that federal agencies become a model for information handling and spin off systems, much like the Library of Congress has already done
- Provide a mechanism for the establishment and promulgation of standards
- Adopt a laissez faire approach to the development of bibliographic utilities and state and regional networks with the exception of support for R&D

These objectives suggest that the federal government is not striving to be all things to all people, nor is it seeking to develop a single monolithic structure. It accepts the somewhat messy approach to network development that has taken us very far very fast. In addition, it recognizes that some networks will succeed while others may fail, but the multiple experiments are likely to give the library community a great many more options.

Thus the roles of the federal government are: innovator and manager of its own systems, supporter of research and development, promoter of local initiative and responsibility, subsidizer of collections of national resources, and facilitator in the development of standards.

OTHER ISSUES

Although the subject of this paper is the federal role in library networking, there are issues confronting networks that are not within the preview of the federal government. Most notable among them is a consideration of the relationships between networks. Until quite recently many assumed that network relationships had stabilized. OCLC served the country directly, RLIN met the needs of research libraries, and WLN remained a regional network with some very special software. Service centers brokered the services and and provided additional capabilities depending on the needs of its members.

Some observers wondered if the regional service centers had enough of a reason to continue. Costs were rising and there was an increasing need to develop some justification for charging fees considered by many to be too high. But SOLINET announced plans to adapt WLN software to its Burroughs equipment. Some speculated about the potential impact on OCLC itself if SOLINET were able to create a free-standing regional system.

Before the experiment was tried, however the deal fell apart. For a variety of reasons OCLC withdrew its offer to loan SOLINET money to support the experiment. A few months later NELINET announced a reduction in staff and a retrenchment in its plans for regional development.

While some regional networks appear to be floundering, state library agencies are beginning to explore the possibility of providing automated statewide networks. In addition to providing access to the utilities these networks can incorporate a much higher degree of resource sharing through document delivery because of their geographic proximity.

The final outcome of these maneuverings is uncertain at the time of this writing, but it is likely that the library world will be treated to a series of "networking wars" over the next few years. There is sure to be a lot of blood on the floor before it is all over. The only question is whose blood.

The statewide library networks appear to be in a strong position at this point for a number of reasons. First, technology favors distributed systems. Except for a few services, such as shared cataloging, centralization seems to be fading from the scene. Second, state library agencies have grown in strength both politically and economically. While it is true that state agencies, like all other government agencies, are having a tough time right now, they still have greater institutional strength than many of the regional networks. The pattern of federal support for the last twenty-five years has hastened their development, and they are now looking for expanded services. Finally, networking is ready to move into a new phase in which document delivery becomes more significant. For the next five to seven years, libraries are likely to continue to depend on inter-library loans. Thus, systems that facilitate inter-library loan will be more acceptable.

No matter what happens with statewide network development, however, the question of relationships remains. How do the utilities relate to each other, to the state and regional networks, to the libraries? What will happen to the regional service centers? How do they all relate to the various levels of government? How will issues such as the development of links between the systems be resolved? Will relationships be characterized by competition, cooperation, or some combination of the two? To what extent will networking be centralized or decentralized?

Although one position the federal government could take in resolving the above issues is to act as mediator, or policy maker, there is no reason to expect that it would be successful. It seems most likely that these issues will be resolved in the marketplace.

THE FUTURE

The above issues are upon us, so do not constitute a future concern. The most critical set of networking issues will emerge in ten to twenty years, as direct information services into the home becomes economically feasible and technologically efficient. What will the role of the library be when an OCLC, using Channel 2000 (or some other channel with an interactive capability) can answer queries directly? Perhaps the relationship will be analogous to the relationship between the network television stations and the local affiliates which are licensed to distribute national programming but also provide local programming of their own.

The federal role in an environment as vastly altered as that is too far outside the topic of this paper to speculate, but it will certainly be a concern, and many of the decisions made now will effect that environment.

CONCLUSION

Networks are clearly altering the future of libraries. So far the federal role has been supportive, but non-directive. In spite of repeated statements that the federal government should be guiding and directing network development, that has not been the case, and it is probably a good thing.

In retrospect the decision made by the Library of Congress to release the MARC tapes without specific directions as to their use appears to have been the best possible decision. Experiments were made possible, and networks are probably much stronger for it. So, too, the support provided state library agencies will most likely ensure the continuing local locus of networking activities. These trends: local control, improved services, and economy and accountability are in harmony with the times and are likely to be the determining factors for the future.

BIBLIOGRAPHY

Ackoff, Russell L., Thomas A. Cowan, Peter Davis, Wladimir M. Sachs, James C. Emery, Marybeth L. Meditz, and Martin C.W. Elton, **The SCATT Report: Designing a National Scientific and Technological Communication System.** Philadelphia: The University of Pennsylvania Press, 1976.

Advanced Technology/Libraries(newsletter). White Plains, N.Y., Knowledge Industry Publications, Inc.

Allison, A.M. and A. Allan, eds. **OCLC: A National Library Network.** Short Hills, N.J., Enslow Publishers, 1979.

Anable, Richard. "CONSER: An Update," **Journal of Library Automation** 8:26-30.

Anthony, Robert N., **Planning and Control Systems: A Framework for Analysis.** Boston: Division of Research, Harvard Business School, 1965.

Aronofsky, Julius S. and Robert R. Korfhage. "Telecommunication in Library Networks: A Five-year Projection, **Journal of Library Automation.** 10:5-27 (March 1977).

The ASLA Report on Interlibrary Cooperation. Chicago, Association of State Library Agencies, 1976.

Avram, H.D. and S.E. McCallum. "Directions in Library Networking." **Journal of the American Society for Information Science.** 31:438-444; November 1980.

Baldwin, Paul E., **BCUC Governance and Management.** Richmond, B.C.: British Columbia Union Catalog, January 1980.

Becker, Joseph, ed. **Proceedings of The Conference on Interlibrary Communications and Information Networks.** American Library Association and the U.S. Office of Education. Airlie House, kWarrenton, Virginia, September 28 - October 2, 1970. American Library Assn., Chicago, 1971.

Boals, David M., "Interlibrary Loan Networks: Practical Obstacles on the Road to Utopia." **Public Libraries** Vol. 19, No. 4 (Winter, 1980): 124-125.

Buchinski, Edwin J. **Initial Considerations for a Nationwide Data Base.** Network Planning Paper #3, prepared for the Library of Congress Network Development Office. Washington, D.C., 1978.

Butler, Brett. **A Nationwide Location Data Base and Service.** Network Planning Paper #1, prepared for the Library of Congress Network Development Office. Washington, D.C., 1978.

Carlile, Huntington and John H. Burkley, "Legal Aspects of Organizing a Library Network." **Bulletin of the American Society for Information Science** Vol. 6, No. 5 (June 1980): 16-18.

Casey, Joseph and others. **An Evaluation of Title I of the Library Services and Construction Act.** Final Report, January, 1981. Prepared for Office of Program Evaluation, U. S. Department of Education. Applied Management Sciences. Available from ERIC.

Council of Wisconsin Librarians Documents including: **Background and General Information**(December, 1980); **Articles of Incorporation Bylaws**(third revision April 1977); **Bylaws Appendix I Organizational and Operational Guidelines** (May, 1978). Unpublished.

Cuadra Associates, Inc. **A Library and Information Science Research Agenda for the 1980's.** A final project report prepared for the U.S. Department of Education, 1981.

Drake, Miriam A. "The Economics of Library Networks," in Barbara Evans Markuson and Blanche Woolls, eds. **Networks for Networkers.** New York, Neal-Schuman Publishers, Inc., 1980.

Epstein, Hank. "Network Technology Today." **Journal of the American Society for Information Science.** 31:425-438; November 1980.

Funk, Carla, Nancy John, Ruth Vann, and Bertha Appleby, "Into the Eighties: The Future of Technical Services". **Illinois Libraries** Vol. 62, No. 7 (September, 1980): 584-639.

Grant, W. Vance and Eiden, Leo J., **Digest of Education Statistics 1980.** Table 189. General Statistics of Public Libraries, by Population of Area Served: United States, Fiscal 1974. U.S. Government Printing Office, Washington, D.C., p. 219.

"High Grades Go to WLN in SOLINET Review." **Library Journal** 104 (October 15, 1979): 2148.

Jacobs, Mary Ellen, Richard Woods, and Judith Yarborough, **Online Resources Sharing II.** San Jose: California Library Authority for Systems and Services, 1979.

Jones, C. Lee, "Planning for Governance at the National Level." **Bulletin of the American Society for Information Science.** Vol. 6, No. 5 (June 1980): 10-11.

Kemeny, John G. **Man and the Computer.** New York, Scribner's, 1972.

Kent, Allen and Thomas J. Galvin, eds. **The Structure and Governance of Library Networks.** Proceedings of the 1978 Conference in Pittsburgh, Pa. Co-sponsored by the National Commission on Libraries and Information Science and the University of Pittsburgh. New York, Marcel Dekker, 1979.

Knapp, J.F. "Requirements for the National Library Network: A View from the Local Network," **Journal of Library Automation.** 10:131-141 (June 1977).

Kovacs, Gabor J., Donald A. Smalley, and Michael B. Wessells, "The Effects of Linking Bibliographic Utilities: A Progress Report." **Bulletin of the American Society for Information Science** Vol. 6, No. 5 (June, 1980): 18-20.

Ladenson, Alex, ed., "American Library Laws, 4th edition, 2nd Supplement, 1975-76." Chicago, American Library Association, 1975.

Malinconico, S. Michael, "Governance Structures for a National Bibliographic Network." **Bulletin of the American Society for Information Science** Vol. 16, No. 5 (June 1980): 12-13.

Markuson, Barbara Evans, **The Indiana Cooperative Library Services Authority--A Plan for the Future.** Final Project Report of the Cooperative Bibliographical Center for Indiana Libraries (COBICIL) Feasibility Study. Indianapolis: The Indiana State Library, May, 1974.

Markuson, Barbara Evans and Blanche Woolls, **Critical Issues in Cooperative Library Development Networks.** Indiana Department of Public Instruction, Division of Instruction Media.

Markuson, Barbara Evans and Blanche Woolls, Eds. **Networks for Networkers** New York: Neal-Schumann, 1980.

Martin, Susan K. **Library Networks, 1981-82.** While Plains, New York, Knowledge Industry Publications, Inc., 1981.

Mason, Marilyn Gell. **Public Library Finance.** A commissioned paper prepared for the U.S. Department of Education, 1981.

Mason, Robert M., "Introduction: The Challenge of Information Service Management." **Information Services: Economics, Management, and Technology.** Robert M. Mason and John E. Creps, Jr., (Eds.) Boulder, CO: Westview Press, 1981.

Mastropoll, John M., "Regional Support System Aims for Local Control." SOLINEWS, the SOLINET Newsletter, Vol. 9, No. 1 (January 1981): 6-7.

Matthews, Joseph R., **Choosing an Automated Library System.** Chicago: American Library Association, 1980.

Matthews, Joseph R., **Turnkey Automated Circulation Systems: Comparative Information.** May, 1980.

Matthews, Joseph R., Susan K. Martin, and Arthur Plotnik, "Understanding the Utilities, A Special Current-Awareness Presentation." **American Libraries** Vol. 11, No. 5 (May, 1980): 262-279.

Meise, Norman R. **Conceptual Design of an Automated National Library System.** Metuchen, N.J., Scarecrow Press, 1969.

Miller, Richard H., "The Prospect for Technological Innovation in Scientific and Technical Communication" in Robert M. Mason and John E. Creps, Jr., **Information Services: Economics, Management, and Technology.** Boulder, CO: Westview Press, 1981.

National Commission on Libraries and Information Science. **Toward a National Program for Library and Information Services: Goals for Action.** Washington, D.C., NCLIS, 1975.

A Nationwide Network: Development, Governance, Support. An unpublished discussion paper resulting from a meeting held by the Library of Congress Network Advisory Committee October 1-2, 1980. Washington, D.C., Library of Congress, January 1981.

Network Technical Architecture Group. **Message Delivery System for the National Library and Information Service Network: General Requirements.** Network Planning Paper #4, prepared for the Library of Congress Network Development Office. Washington, D.C., 1978.

New York State Commission of Education, Gordon M. Ambach, **New Directions. A Report......on Library Pilot Projects.** A report of the Commission of Education to the New York State Legislature, Organized Under Chapter 787, Laws of 1978, New York State, (July 1, 1979-June 30, 1980) The University of the State of New York. The State Education, Albany, New York 12224.

Office of Libraries and Learning Technologies. **Strengthening Research Library Resources Program.** Washington D.C., U.S. Department of Education, 1978, 1979, 1980.

PALINET and Union Library Catalogue of Pennsylvania, Documents including: **Bylaws(amended 1975, 1976, 1978); Agreement between Pennsylvania and the Ohio College Library Center (1977); Agreement for OCLC Participation(n.d.); OCLC Participating Libraries as of 1980 September 30; Palinet Policy**

on Terminal Location (September 16, 1980); **OCLC 200 Implementation and Purchase Order Form and for OCLC 105 Terminal;** and general background information (November, 1980) Unpublished.

Palmour, Vernon E. and Nancy K. Roderer, "Library Resource Sharing through Networks" in Annual Review of Information Science and Technology, Vol. 13, ed. by M.E. Williams. Washington, D.C.: American Society for Information Science, 1978: 1-31.

Patrick, Ruth J. and others. **A Study of Library Cooperatives, Networks and Demonstration Projects. v.1 Findings and Recommendations. v.2 Case Study Reports.** Prepared for U.S. Office of Education, Office of Planning, Budgeting, and Evaluation, 1979. New York, K.G. Saur, 1980.

Payne, Charles, et.al. "The University of Chicago Library Data Management System." **Library Quarterly.** 47:1-22.

Penniman, W. David, "Networking and Information Services: Prospects and Pitfalls." **Information Services: Economics, Management, and Technology.** Robert M. Mason and John E. Creps, Jr. (Eds.) Boulder, CO: Westview Press, 1981.

Plotnick, A., J.R. Matthews and S.K. Martin. "understanding the Utilities," **American Libraries.** 11:5, 262-269 (1980).

Porat, Marc, **The Information Economy: Definition and Measurement.** Washington, D.C.: U.S. Government Printing Office, 1977.

Resources and Bibliographic Support for a Nationwide Library Program. Washington, D.C., National Commission on Libraries and Information Science, 1974.

Robinson, Barbara M. "Cooperation and Competition among Library Networks." **Journal of the American Society for Information Science.** 31:413-425; November 1980.

Rouse, William B. and Sandra H. Rouse, **Management of Library Networks.** New York: John Wiley & Sons, Inc. 1980.

The SATORI Group, **Memory Technology.** Proprietary technical brief available from the Satori Group, P.O. Box 28758, Atlanta, Georgia 30358; 1980.

Scholarly Communication: The Report of the National Enquiry. Baltimore, Johns Hopkins Press, 1979.

Segal, Ronald, "Technical Considerations in Planning for a National Library Network." **Bulletin of the American Society for Information Science** Vol. 6, No. 5 (June 1980): 14-16.

Shoffner, Dr. Ralph M. and Mary A. Madden, British Columbia

Library Network, A Study of Feasibility. Richmond, B.D.: British Columbia Union Catalog, 1980.

SOLINET Board of Directors, Memo to All SOLINET Members, "Changes in SOLINET's Regional System Development Plan", September 8, 1981.

SOLINET, **Southeastern Library Network, Inc. Bylaws.** (Amended May 9, 1980) and **Application for Membership.** (July, 1980) Unpublished.

SOLINET, **1978 Long-Range Plan, 1980 Update.** Atlanta, GA: Southeastern Library Network (Unpublished)

Smith, Alberta, **Access to Information for North Carolinians,** Multitype Library Cooperation Working Paper No. 1; Raleigh, NC: Division of State Library, North Carolina Department of Cultural Resources, February 1981.

Stanley, J. Swihart and Beryl, F. Heflee, **Computer Systems in the Library: A Handbook for Managers and Designers.** Los Angeles: Melville Publishing Company, 1973: 97-124.

State of Indiana, **Library Services Authority Act.** Chapter 47, Acts of 1967 (Chapter 254, Acts of 1977) (II 20-13-6-1-20-13-6-16). Indianapolis, The Indiana State Library. The Extension Division.

Stevens, Norman D. "Library Networks and Resource Sharing in the United States: An Historical and Philosophical Overview." **Journal of the American Society for Information Science.** 31:405-413; November 1980.

Stevens, Norman and James E. Rush. **Issues Relative to the Role of State and Multi-State Networks in the Evolving Nationwide Bibliographic Network.** An unpublished report prepared for the Council on Library Resources, Inc. by James E. Rush Associates, April, 1981.

Tannehill, R.S. Jr., ed. "Governance of Networks," **Bulletin of the American Society for Information Science.** 6:5, 10-20 (1980).

Washington Library Network, (A Packet of Documents) Provided by the Washington Library Network, November 1980.

Woods, Richard, "The Washington Library Network Computer System." **Online Review** Vol. 3, No. 3 (1979): 297-330.